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Research and Working Paper Series No. 169 August, 1980

# APPLICATION OF PROCESS THEORIES TO TEACHING UNSTRUCTURED MANAGERIAL DECISION MAKING

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The paper illustrates the use of CONCORD - a computer program for tutoring groups on-line in skills for solving unstructured problems - in teaching groups of MBA students. Procedures were developed to assist the students to use knowledge of their own problem solving process, their social interaction, their group style of problem solving and of task, environment and resource variables to formulate CONCORD-augmented problem solving strategies. Examples illustrate a range of complex problems that the students discovered, formulated and solved.

(INTERACTIVE PROBLEM SOLVING; GROUP PERFORMANCE; PROCESS THEORY.)

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# 1. INTRODUCTION

Decision making in today's changeful, uncertain organizational environments places a premium on managerial skills in discovering, formulating, solving and implementing unstructured problems. Frequently the decision-making process requires the effective use of such cognitive skills with other managers; that is, many crucial organizational decisions are characterized by the conjunctive interdependence [21] of a set of decision makers where <u>each</u> must make a <u>particular</u> contribution to achieve an effective, coordinated decision.

Joyner and Tunstall [8] reported the development of CONCORD (Conference Coordinator) to tutor groups, on-line, in skills for solving unstructured organizational problems that are characterized by such interdependence among decision makers. CONCORD is a content-free, table driven, response contingent computer pro-CONCORD was designed for use in three contexts: experigram. [8], teaching decision-making skills to (potential) ments managers, and in field applications to managerial and organizational development. The present paper reports the use of CONCORD, and the development of related instructional and observational procedures, in a practicum on computer assisted decision making where groups of second year MBA students have used the teaching procedures to augment their discovery, formulation and solution of a wide range of unstructured problems.

The work reported has its roots in a general, contemporary approach to theory and application in the social, decision and management sciences; namely the construction, testing and application of <u>process</u> theories of behaviour. Specifically, it is offered as an illustration of the application of two major process theories. These are the theory of information processes of Simon and his colleagues [17], [18], [19, [20], [6] and Bales' theory of social interaction processes [2], [3].

The computer has made it possible to express, deduce and trace the consequences of theories of human cognitive processes and to handle their detailed blow-by-blow outputs. Thus such theories can be stated explicitly and are subject to scientific falsification. We therefore have a positivistic and general alternative to the antecedent - consequent, hypothetico - deductive approach that has driven theory construction, testing and applications during the early development of the management, decision and social sciences. We can also use the process ideas, activated by the computer, to invent detailed, explicit applications - such as CONCORD - to organizational decision making issues.

#### 2. THE CONCORD COMPUTER PROGRAM

A summary of CONCORD will facilitate understanding its use in teaching collaborative, managerial problem solving skills.

The parameter values of CONCORD's table are linked to English language messages. Typically, the messages request a group, seated around a terminal, to reach a decision on a problem solving activity; like, 'Will someone propose a different solution to the problem?' or, 'This is a really excellent idea. Does everyone agree?' A different set of parameter values would change the second message to, 'This idea seems acceptable. Does the majority agree?' The group responds Yes or No after discussing each decision request. The response advances the program to its next message request through the logic of the program's executive routines. The entire sequence of program advances and message requests is determined by the table's parameter values and the history of group responses that have been made under these values.

CONCORD's set of parameter values can be thought of as specifying an operational strategy for its users' entire sequential process of decision-making. These values can be selected and initialized by experienced users to assist them in carrying out a problem-solving strategy that they have formulated prior to their on-line interaction. The parameter values can be reset whenever a group decides to shift to a different strategy.

CONCORD's major parameters permit the inclusion or exclusion, and the sequencing of a limited number of information processes. The assumption is that these processes can be regarded as cognitive skills and that, like other identifiable skills, humans can learn to acquire these cognitive skills with practice. The further assumption is that, as with other skills, humans can learn to match cognitive skills from their total repertoire to their perception of the ongoing environmental problem-solving requirements in such ways as to improve their performance across a wide range of situations - just as the expert skier uses different, learned, perceptual-motor skills over changing terrain, snow, lighting and weather conditions to achieve his desired speeds and aesthetic or emotional experiences. The teaching program is

designed to identify certain cognitive skills, and to assist users to practise to perform them effectively and use those skills that are appropriate to the changing problem solving requirements that they encounter or create.

CONCORD's major parameters: 1) partition problem solving activity into four phases; problem discovery and definition, statement of objectives; solution; and implementation (P,O,S,I,), 2) permit the inclusion of any phase at any position in a problem solving sequence (e.g. only phase 0; or,  $P \rightarrow 0 \rightarrow S \rightarrow P \rightarrow 0$  $\rightarrow$  S; or, S  $\rightarrow$  0  $\rightarrow$  S  $\rightarrow$  I; or, no initialized phase sequence, phase(s) selected prior to each anticipated phase activity), 3) indicate that any phase contains subphases associated with either generating (G) or with evaluating (E) ideas (e.g. OG only; or  $PG \rightarrow OG \rightarrow OE \rightarrow SG \rightarrow SE \rightarrow PG \rightarrow PE \rightarrow OE \rightarrow SG \rightarrow SE)$ , 4) specify two types of processes that can be used to generate ideas in any subphase (e.g. individual vs. group activity; and, proposing new vs. modified ideas) and three sets of processes relevant to the evaluation of ideas in any subphase (e.g. satisficing vs. compromise; evaluating after  $\mathbb{N}_{1}^{\text{all}}$  ideas; and, decisions by consensus or majority [8].

The problem solving processes and their associated messages are representated on six major parameters in the program's table. This limited set of processes can be combined into a large number of sequential problem solving strategies since the processes can be included or excluded, sequenced, or changed through resetting the table values. For example, a brainstorming session on the formulation of objectives for a new product might use only

OG - one subphase with no evaluation. Planning the design and evaluation of the same new product might require a complex sequence of activities. These latter activities would likely identify certain phases of well structured problem solving that might not be augmented by using CONCORD. Organizational problem solving is often marked by such alternation between structured and unstructured subphases in decision making. The distinction is important to users in deciding when problem solving may be augmented by CONCORD and when CONCORD's use may diminish problem solving problem performance.

# Objectives in teaching CONCORD interactively

As used in teaching, CONCORD is a user-oriented tutorial program, not a single model. It was designed to be used flexibly, both on a variety of (unstructured) tasks and by groups in organizations who might, over time, develop different, effective decision making 'styles'. For example, given a particular task, environment and set of resources, one group may have learned to use an effective, inductive problem solving strategy by moving flexibly from testing out solutions, to stating objectives, to testing additional solutions, to (re)defining the problem... This behaviour is similar to some of the approaches to decision making that were suggested recently by March [13]. Another managerial group may have learned to be equally effective through a more deductive problem solving approach to the same task, given the same resources and environment. That is, we assume a limited repertoire of human problem solving skills. We do not assume an ideal strategy - or limited set of ideal problem solving strategies - across groups, tasks,

resources and organizational environments. We anticipate that interactions among these variables can be discovered through subsequent research.

The decisions made through using CONCORD in teaching reflected these assumptions. The teaching program was not structured to produce or prescribe normative behaviour across group, task, resource and environmental variation. Rather, it identified certain problem skills, provided a limited opportunity to practise these skills, and drew users' attention to certain possible relationships between tasks and skills. Most of the additions to the teaching program and changes in CONCORD were designed to assist the human users acquire more knowledge of their own cognitive and personalsocial problem solving processes and of their resource environment so that they, themselves, could better decide how to use this information more flexibly and effectively to improve their problem solving performance. Few changes were made to increase the computer program's knowledge, logic, control or power. This might have been done, for example, through incorporating suggestions to use general problem solving strategies and heuristics like means-end analysis [16] or other procedures that have been developed [1], [14], [15] for solving unstructured organizational problems. Instead, the man-computer teaching system that has been under development during the last ten years has been designed to increase the human's performance chiefly through augmenting the human users' knowledge of their ongoing behavioural processes and their immediate environment.

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In summary, in a typical problem solving session a group decides on a general problem solving strategy that it believes will promote the highest quality of problem solving and solution. The group's choice of strategy takes into account: 1) the members' knowledge of, and skill in problem solving and social interaction processes, 2) their perceptions of the task, the environment and of the resources available, and 3) the group's history of problem solving. The group then decides on the subphase(s) and phase sequence they plan to use and selects the appropriate procedural options for the other five (two for generating and three for evaluating ideas) process parameters for each subphase. They then call the CONCORD program, initialize the table values that operationalize their strategy, and begin on-line interaction. CONCORD then provides a sequence of requests for group problem solving activities that are consistent with the consequences of its table values and the history of the group's Yes-No responses under these values.

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The group members provide all the substantive content. The program knows nothing. All feedback on decisions - other than CONCORD's program advances - is provided to one another by the decision makers.

Therefore CONCORD keeps track of the detailed sequential conquences of the strategy and, by its requests, keeps users focussed on one tactical process at a time. The groups formulate the strategy, provide all the content and furnish one another with

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feedback on the efficacy of their problem solving processes and social-emotional interaction. This feedback may cause them to change their CONCORD strategy. It may also cause them to break from CONCORD as they gather external information, work on a wellstructured subphase or engage in social-emotional interaction that they believe would not be augmented by use of CONCORD. CONCORD was deliberately designed to be used as an instructional device that provided such loose program control and that placed the aspects of problem solving requiring flexibility, initiative, imagination and social facilitation in the hands of its human users.

These objectives and theoretical predispositions have led to the development of the teaching program that contains a number of elements additional to the computer program. Most were introduced to enable users to provide themselves with information about their actual sequential problem solving behaviour and social interaction that they could use to improve their own performance as they made decisions in response to CONCORD's requests.

# 3. CONCORD TEACHING PROGRAM WITH MBA STUDENTS

#### Outline of Practicum

Since 1970 over thirty groups of second year MBA students have taken a thirteen week, elective, MBA II credit course in computer assisted decision making at York and McMaster universities. The CONCORD - based practicum was under continual modification and informal evaluation by instructors and students. Representative illustrations and a summary description are presented here. Detailed CONCORD manuals containing program information for users

and the observation and feedback procedures that were introduced after 1970 are included in the references [25], [24], [7]. In addition to the listing and block diagrams of the original CONCORD program [23], written in PDP9 assembler for the Ontario Institute of Studies in Education's department of Computer Applications, a tested listing exists in FORTRAN IVG for the CDC  $6400^1$  and there is an untested version in BASIC for the HP 2000<sup>1</sup>.

The typical MBA group has had 7-9 members, with groups being formed by the students from classes of 30-45 students who elected the practicum. Four to six students acted as problem solvers at each session while the others acted as feedback observers of problem solving process, of social interaction and of crtitical incidents. Roles changed weekly during the first 6-7 weeks of practice sessions while the students were learning to use CONCORD, largely through solving a number of short cases that had been developed for the learning package. Each group discovered and formulated its own major problem solving project and carried it out during the last 6-7 weeks. Groups had twelve, 3-5 hour sessions plus a project presentation at the final meeting of the class. Groups scheduled many additional problem solving sessions. Each group carried out its problem solving sessions at York in a separate room furnished with tables, chairs, blackboard, paper and a teletype terminal. Nearby seminar rooms or offices were available for group meetings. The entire class met for lecture-discussion sessions in a larger, nearby seminar room. Observers prepared weekly group reports during the practice

sessions. These were submitted and returned with comments prior to the next session. A major report, including detailed accounts of the weekly on-line sessions, was prepared on each group's project and presented at the final meeting. Each weekly report included: the teletype output and the observation protocols and questionnaires; an analysis of these data; an evaluation of the CONCORD procedures and resources; and an evaluation of the group's performance and of the (perceived) quality of their session's solution. Many ideas for modification of the practicum came from these reports.

A representative illustration of the sequence of teaching segments in shown in Exhibit 1.

# Exhibit 1 about here

Exhibit 1 demonstrates the practicum character of the CONCORDbased course. The formal classroom instruction terminated after the third session, decreased during these three sessions, was directed toward getting students oriented to the problem solving and observation procedures, and was replaced by a tutorial relationship between the instructor(s) and each of the small groups. The cases developed for use prior to session five were deliberately made remote from the student's managerial interests while the students were learning the CONCORD procedures and information processing behaviours. Following session three nearly all the students' time was spent in actual problem solving - much of it on-line.

The students' grade was assigned entirely from their pro-

blem solving reports. Formal course evaluations by the students were high, and the cost of teletype and time-sharing rentals was about \$25/student/course.

## The Development of Teaching Procedures

Most complex organizational decisions require managers to engage in social-emotional interaction, to solve structured as well as unstructured tasks and to use external resources and information as well as to be skillful in information processing. Most of the additions that were introduced into the teaching program were introduced to assist the groups to use their knowledge of their own social-emotional interaction and the **require**ments of task environments more effectively while acquiring cognitive problem solving skills. Illustrative examples follow.

Exhibit 1 showed that, in the early practice sessions, a distinction was introduced between subphase skills in generating ideas and subphase skills in evaluating ideas. This was done: by the selection of the first cases and parameter settings; 1) 2) by providing explicit linkages in the teaching manuals [24], [7] between the different parameter settings and appropriate verbal and social behaviours; 3) later, by introducing the role of the problem solving process observer to feed back his observations of the subphase sequences that were observed in problem sol**vi**ng. Students found this a difficult distinction to maintain. We do not know whether the explanation lies in the disfinction itself, in the teaching procedures or in the limited amount of practice. On the other hand, the students learned readily to recognize and produce behaviours appropriate to the

phases :(P,O,S,I).

A number of additions were made to facilitate certain student-student and group-CONCORD interactions that had not been anticipated in designing CONCORD. It was observed that, at times, students disengaged themselves from the program's requests. This in itself was not unexpected due to the deliberately loose program control. Some of this activity was characterized by socialemotional interaction. Some social behaviour appeared to faciliitate problem solving; some appeared to be disruptive. The techniques for the observation (of group communication, participation, sociability and identification) and the feedback of the socialemotional interaction process were developed to increase the students' knowledge of such interaction and to help them to use such knowledge to engage in social-emotional interaction that facilitated the quality of problem solving in their particular group. Post-meeting questionnaires were also designed. These contained related items on the perceived quality of the solutions and on the social-emotional and problem solving processes. These observations were also fed back to the group by the observers and discussed.

Other (disengaged) activities were unquestionably devoted to carrying out structured phases of problem solving particularly on the major project. The students were tutored to make this unstructured-structured distinction, and a program BREAK (for 'activity X') was made available to enable students to record such activity on the teletype output. It also became clear that

some of their structured, as well as some of their unstructured information processing would be facilitated by the use of external memories. Blackboards, chalk, paper etc. were placed in the small rooms and were used frequently.

Experienced users often learned to react to CONCORD's requests as they were being typed out, and even to anticipate CONCORD's next requests - sometimes with confusing consequences. Short forms of the original messages were written and were used by experienced students. The program was also modified so group ideas - messages, decisions etc. - were typed on the teletype output after each CONCORD request. CONCORD was also modified to make it easier for experienced users to move readily from (sub) phase to (sub)phase and to reset CONCORD's table values.

One observer kept track of time. The social interaction and problem solving process observations were judgments made over one-three minute intervals and the anecdotal record had times associated with the descriptions of incidents. Therefore the teletype output (with times typed in) was coordinated with the observations to provide a detailed, sequential description of the member-member and group-CONCORD problem solving process.

Students often reported that their choice of strategy was influenced by the history of successful problem solving activities that they had developed in their particular group - their group's preferred 'style' of problem solving, perhaps. A variety of different, effective styles were developed in the various groups. Instructors recognized this and encouraged students to include style as one of their important resources in selecting and using strategies for different task-environments. The distinctive style of problem solving, that many groups developed, interacts with group, task and environments to affect the experienced groups' choices of preferred strategies. Complex issues such as this, beyond the reach of our present knowledge, led instructors to use group tutoring when such uncertainties often offered an opportunity for self-improved group performance if not for immediate understanding.

One wider issue had been of interest; namely, the crucial decision a managermust make of whether or not to use a group in decision making. We have begun to include a review of the Vroom-Yetton [27] schema in the introductory lecture - discussions to give prominence to what may be a major factor in an operating manager's decision about the appropriate organizational decision-making process to use.

Exhibit 1 indicated that priority was given to teaching a set of generally preferred relationships between the characteristics of tasks and problem solving strategies. A distinction was made and taught between 'alternatives' and 'conditions' [26 problems and preferred strategies for each type of problem were practised. In future uses of CONCORD the Thompson-Tuden [22] categories and strategies for organizational problem solving will be reviewed, to assist groups to select parameter values for their strategies).<sup>2</sup>

# 4. INFORMAL EVALUATION

#### The CONCORD Teaching Program

The students' projects were often designed as mini-esperi-

ments or as comparison studies. The projects present informal evidence on CONCORD's immediate effectiveness in teaching managerial problem solving skills. A few examples are illustrative. First, several projects indicated that CONCORD - designed to facilitate coordinated solving of unstructured problems characterized by conjunctive interdependence [21] could also be used to resolve group conflict - e.g. in collective bargaining - and to promote creativity - e.g. to create complex new strategic games or short stories. A number of projects indicated that the quality of CONCORD-trained students' solutions compared favourably with those of non-CONCORD trained: 1) peers - in evaluations of their major project in the concurrent MBA policy course; 2) committees or task forces in actual organizations - recommending: a merger of EDP and Personnel functions in a company; the introduction of a short work week into an industrial laboratory; programs to reduce drug abuse in a high school, etc,; 3) expert consultants - recommending: revision of business and engineering programs at a community college; reorganization of two social agencies etc.; 5) experts' predictions of objectively verifiable outcomes in professional football, trotting races, systems of bidding in bridge, and the like. A number of other projects were formulated to solve a (practical) organizational problem of some complexity without comparison with another group of problem solvers - recommending new procedures for a university bookstore, forming an MBA alumni, redesigning the MBA program in quantitative methods to meet behavioural performance objectives, et**c.** 

The project reports and other data have provided informal evidence that a CONCORD-based program was effective in teaching problem-solving skills on a variety of unstructured problems that the students themselves had formulated. The evidence is informal since in their comparison studies and quasi-experiments the students had essentially selected their own treatment conditions and cell size was usually 'l' - two major constraints to the construction of inferential and generalizing statements. The evidence does not permit the identification of detailed elements in the teaching program that accounted for the behaviour.

### Related Development

CONCORD was also designed for use in laboratory experiments and organizational development. Tunstall's [8] experimental tests of CONCORD had made it clear that modifications would be required for laboratory experimentation. An extensive effort was made to program a version of CONCORD that would be more suitable. This version linked on-line users at separate terminals, provided users. with access to storing and retrieving information that they developed during decision making, provided a combined computertelephone communication network [9] under experimenter control and permitted more extensive monitoring and control by experimenters. This work was discontinued after a programming-communication system had received initial testing on the PDP9 system.<sup>3</sup> Such a facility seems essential to an experimentally-based evaluation of the CONCORD mechanisms.

Second, CONCORD was designed, in part, to improve the capabilities of human decision-makers in man-machine and man-man

organizational decision making systems. This remains an applications objective. To date we have not been able to carry out a program-evaluation of the use of CONCORD in a organization. It has been difficult to do this without entering into consulting relationship for organizational development. Such relationships are difficult to establish and have rarely led to organizational studies that have been characterized by powerful experimental designs. Hence the priority that has been given to simulation, teaching and to the development of a CONCORD experimental laboratory.

Therefore, no evidence exists yet on the transfer of CONCORDbased skills to the actual management of organizations. A questionnaire was sent out to many of the MBA students who had taken the practicum at York. Their replies showed that in their jobs: 1) they had rarely used CONCORD interactively although some of them wrote or adopted FORTRAN and APL versions for use, 2) they rarely used CONCORD problem solving skills together with a group of other managers, 3) the skills sometimes were used explicitly by them as individuals in decision making, both on and off the job. Despite the many conferences, task forces and meetings that occur in organizations, it would seem that systematic, on-line tutorial, group decision making is infrequent in organizations. It is difficult, too, for relatively junior managers to get a number of managers to learn a common set of problem solving processes for actual use in their inter-departmental decision making in organizations.

Additional work was carried out in developing a version

for teaching the CONCORD problem solving skills without access to computers. This was used, but not formally evaluated in daily, one-three hour sessions extending over two weeks with two classes of managers in Canada and one group of European administrators.

#### Concluding Comments

It can be contended that we have reasonable knowledge of a useful repertoire of information processing skills that managers require to discover, formulate and solve unstructured organizational problems. We may know less about the complexity of these skills and the practice required to achieve high levels of performance than we do about perceptual motor skills. We need to know more about the ways that individuals and groups with different problem solving histories can select and sequence these skills differently to solve various tasks in changeful perceived environments. The environment appears to be more complex and more difficult to read than are the environments associated with the exercise of perceptual-motor skills. In the absence of such knowledge the CONCORD-based teaching program was deliberately developed to encourage its human users to be inventive and to provide us with some informal knowledge of their innovation.

Some of the estimates of the parameters of human memories etc. that guided the development of CONCORD have only been systematized [20], [17] since the research and development on CONCORD began in 1968. Therefore, the illustrative procedures that were reported are regarded as tentative. They have been offered in the hope that they may interest others in experimenting. The procedures were developed from certain ideas on individualsocial information processing that were reasonably well established by the mid 1960's and from a commitment to applications of process theories of thinking and social interaction to organizational decision making. The on-line program and the process observations of problem solving and social-emotional interaction reflected this knowledge base. There must be many other approaches to teaching information processing skills from different vantage points. The skills themselves, and the flexibility of their effective use, are essential to the effective management of complex organizations.<sup>4</sup>

#### FOOTNOTES

- The writer wishes to thank Ian Malloch and William Bell of the Computing Centre, McMaster University for writing and implementing these versions of CONCORD.
- 2. A colleague, Dr. Ian Meadows of the Faculty of Business, McMaster University made this useful suggestion and mapped these categories on to CONCORD'S parameter values.
- 3. Drs. Kenneth Tunstall, Robert MacLean and Mr. David Ensor carried out most of the design and implementations of the complex information processing laboratory facility.
- 4. The research leading to this paper was supported in part by a Killam Award (Canada Council Grants 68-1359, 69-1590, 70-1426).

# EXHIBIT 1

SEQUENCE OF CONCORD TREACHING SEGMENTS

SESSION	LECTURE-DISCUSSION	USE OF CONCORD PROGRAM IN PROBLEM SOLVING	GROUP ACTIVITY
1	1.1.1 Human Problem Solving: systematic approach to managerial problem solving; ill-structured and well structured problems; infor- mation processing, human memory parameters; effects of interruptions on infor- mation processing, group problem solving implications. 1.1.2 CONCORD theory: Phases (POSI); subphases (generate-evaluate); strategies for problem solving; application to managerial deci- sion making. 1.1.3 The CONCORD computer program: introduction and rationale.	1.2.1 Introductory exercises: Signing on and off; inter- acting with the program; specifying and completing a conference run.	1.3.1 Formation of permanent groups for practice (sessions 1-6) and major group project (sessions 7-13).
2	<ul> <li>2.1.1 The background of CONCORD theory: relevant group dynamics theory.</li> <li>2.1.2 The CONCORD theory: the problem solving activities, skills for generating and evaluating ideas.</li> <li>2.1.3 Observation and Group Self-Evaluation: Introduction; Frocess observation of: 1) problem solving and 11) interaction.</li> </ul>	2.2.1 Introductory Exercises: Specifying within (sub) phase strategies; request operators; relationships bet- ween parameter values, CONCORD questions and state- ments, and associated problem solving activities.	<ul> <li>2.3.1 Resource allocation and planning for group problem solving.</li> <li>2.3.2 Preliminary discussion of group projects.</li> </ul>
3	3.1.1 Observation and Group Self- Evaluation and Feedback: Observation of problem sol- ving process and interaction process; judgments over time- intervals of subphase activity; judgments of interaction over time-intervals (re: communica- tion, participation, sociabi- lity and identification). Inter-observer reliability checks; anecdotal record observations; post meeting questionnaire; feedback sessions; data analysis.	<ul> <li>3.2.1 Problem Solving of Cases with Prescribed Strategies: Practice subphase skills. Practice observer roles.</li> <li>3.2.2 Case 1 (The New Classroom): Objective: Practise learning to generate (G) ideas in an Alternatives-type problem solving task; inter observer reliability check periods; 3 observer roles; post meeting questionnaires (p.m.q.); feed- back.</li> <li>3.2.3 Case 2 (Smoking): Objective: Practice learning to evaluate (E) ideas in a Conditions-type task. 3 observer; inter-ob- server reliability tests; p.m. q.; feedback.</li> </ul>	<ul> <li>3.3.1 Feedback and discussion of each problem solving conference.</li> <li>3.3.2 Detailed report, with all data analysis and evaluation for each case.</li> </ul>
4	<ul> <li>4.1.1 Discussion of previous session's problem solving and observation prior to problem solving.</li> <li>4.1.2 Discussion of 3 observation and feedback roles.</li> </ul>	<ul> <li>4.2.1 Problem Solving of Cases with Prescribed Strategies:</li> <li>4.2.2 Case 3 (Typing): Objective: Practise distinction between G and E and between Alterna- tives and Conditions tasks. Practise observation (3) and feedback.</li> <li>4.2.3 Case 4 (A Day's Wages) Objective: Familiarization with range of process skills and associated parameter values. Practice all observer roles and feedback.</li> </ul>	<ul> <li>4.3.1 Feedback and discussion of each case.</li> <li>4.3.2 Detailed report on each case.</li> <li>4.3.3 Plan group project with instructor(s) importance of discovering a compelling problem; experimental design; observation; analysis; format of project session write-up.</li> </ul>
5-6	<ul> <li>5.1.1 Discussion, prior to problem solving, of previous session.</li> <li>5.1.2 Develop the choice and appli- cation of problem solving strategy skills as a function of task, environment and resources, group skills and group problem solving style. Implications of observations for knowledge of above.</li> </ul>	<ul> <li>5.2.1 Four, more complex, organizational and managerial cases where group formulates its own problem solving strategies. Priority to quality of solution and to related process skills.</li> <li>5.2.2 Four cases chosen from: Staff Specialists, CPL, IEEE, Noise Pollution, Water Pollution, Social Indicators, Xerox.</li> <li>Objective: Practice in selecting and implementing own strategies as appropriate to quality solution considering task, group member skills, group style, environment and resources.</li> </ul>	<ul> <li>5.3.1 Feedback and discussion of each case.</li> <li>5.3.2 Detailed report on each case.</li> <li>5.3.3 Designing, planning and documenting major project with instructor(s).</li> <li>5.3.4 Detailed report evaluating all practice sessions.</li> </ul>
7-13	<ul> <li>7.1.1 Consultations with instructor(s) on project by each group.</li> <li>7.1.2 One brief class discussion of project development - about session 9.</li> </ul>	<ul> <li>7.2.1 Use of CONCORD continues as appropriate to problem solving.</li> <li>7.2.2 Continuation of observation and feedback.</li> </ul>	<ul> <li>7.3.1 Carry out all phases of project.</li> <li>7.3.2 Same detailed documentation and write-up of each problem solving session.</li> <li>7.3.3 Major project report: Format-similar to a report on an experiment. Include all data. Include a detailed: 1) evaluation of the quality of the group's process and solution, ii) evaluation of the use of CONCORD on solving ill-structured problems.</li> </ul>

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