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THE PEDAGOGY OF BEHAVIOUR SIMULATION

by

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New discoveries in the field of human learning and growth, new advances in technology in general, and in the techniques of behavioural modification and behaviour change in particular, have stimulated new experiments in pedagogical methods and approaches. New methods and techniques have been proposed to make learning more effective. It may be useful to have a conceptual framework to look at the various teaching-learning methods and techniques in a meaningful way.

Pedagogical Methods : A Conceptual Framework

In order to understand the various pedagogical methods and techniques it may be useful to consider some significant dimensions. Three dimensions seem to be important in this respect: the amount of student activity allowed in the method or technique, the amount of emphasis on cognitive learning, and the amount of emphasis on providing experience to and scope for experimentation by the learner. Student activity is not necessarily in conflict with teacher activity or the central role of the teacher. Teacher's role may be quite central, and he may be controlling and directing the activity involved in a pedagogical method, and yet the student activity may be high.

Student activity would involve wider scope for the learner to be active and to take initiative and engage in activities. Emphasis on cognitive learning signifies the concern that the particular activity leads to the formation of certain concepts, or their reformulation in a new pattern. Emphasis on experience and experiment on the part of the learner indicated the concern that the learner undergoes some experience out of which he learns, and the best way to have such an experience is for the learner to try something on his own (experiment). Such experiments may be done either with outside (usually material) phenomena, or with behaviour.

A three-dimensional cube may be constructed out of these three dimensions, each dimension may be conceived as a continuum from high to low. However to simplify discussion, each dimension can be divided into two - high and low. A combination of these may give us 8 different typologies. These are shown in Figure 1. The Figure shows 8 different categories or typologies of pedagogical methods. These are briefly discussed below :

Figure 1 about here

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1. Inspirational Methods: These methods are primarily based on high activity on the part of the instructor or teacher. Giving a sermon to the student or to any group of learners is a good example of this methodology. In this methodology, all the three dimensions are low.

2. Expository Methods: In these methods cognitive emphasis is very high, while student activity and emphasis on experience is low. One good example of expository method is the lecture method in which the main emphasis is on imparting cognitive information to the learners.

3. Natural Learning Methods: The main rationale of these methods is that learning takes place in a natural way and planning for learning is not necessary. Learners are left on their own, with free and unplanned activity. Thus, the emphasis on learner activity is high, whereas it is low on planned experience and on cognitive inputs.

4. Individualised Methods: These methods are quite well known mainly through the popularity of programmed instruction. The main characteristic of these methods is the guided search encouraged by the instructor or the teacher. These methods are low on providing experience to or experimentation by the learner, and are high on both learner activity and cognitive emphasis. In addition to programmed instruction, self-study, computer-oriented instruction, case method, and prescribed experiments in science are other examples of individualised learning in which the main emphasis is for each learner to learn at his own pace.

5. Behaviour Control Methods: In these methods the main emphasis is on experience by the learners, and there is very low emphasis on both cognitive inputs and learner activity. The various methods of behaviour control come under this category. There is almost *conclusive evidence that the efficient technique of teaching social* skills are modelling by the teacher or the facilitator, and differential reinforcement of behaviour (Cartledge and Miburn, 1978). Both these emphasise a specially designed programme in which the learner is not directly approached, but his behaviour is influenced either through the behaviour of the instructor or through management of rewards and punishment meticulously planned. Thus, the learner is neither able to experience or experiment, nor does he learn the cognitive basis of change occurring, unless, of course, such an input is provided for this purpose. A good example of change of behaviour through pure experiencing is hypnosis.

6. Controlled Exposure Methods: These methods are high both on cognitive inputs and on experience and experimentation, but learner activity is low. In these methods the learner is allowed to experience without being active himself. Films, demonstrations of various kinds to allow the learner to experience what is being demonstrated, are some examples of such methods. Several methods of controlled simulation also come under this category.

7. Encounter Methods: Carl Rogers had popularised the term 'encounter', although several other terms are used like T-Group, L-Group, sensitivity training, interpersonal confrontation and so on. In these methods the main emphasis is on experiencing and learner activity. Since the mephasis is on providing experience through confrontation or through encounter, and not through cognitive understanding, these methods are effective for change in basic behavioural patterns and developing new ways of looking at things. Role play also involves some amount of encounter.

8. Discovery Methods: These methods are high on all the three *dimensions: learner activity, experience and experimentation by the* learner, and cognitive understanding. Simulations primarily come under this category as also self-generated experiements in science. The main emphasis of methods in this category is on problem solving and providing necessary frameowrk to the learner, so that while solving the problem the learner is also able to learn the rationale and logic of what he has done. We shall discuss this a little later.

Goodman (1971) has suggested classification of various pedagogical methods in four categories, based on a combination of two dimensions - whether the emphasis is on essentialism or non-essentialism, and whether the influence exercised by the teacher is direct or indirect.

The dimension of teacher influence comes very close to the dimensions of student activity. Recent researches have, however, shown that student activity and teacher activity are not necessarily contradictory.

Blake and Mouton (1976) have proposed a model of looking at the various techniques used for learning from direct experience in the field of management. They have suggested three dimensions (five aspects of each dimension), and have proposed what they call "critiqube" for understanding these methods. The three dimensions and their aspects proposed by them are :experiences encountered (performance, product, procedure, process, and people), strategies of critiquing learning (inspection, simulation, participant observation and strategic assessment), and management function (controlling, directing, staffing, organising, and planning).

What is Behaviour Simulation?

Formal learning activity, whether for children or for adults, removes the learners from the reality situation. There has, therefore, been a continuous search for ways of bridging the gap between the formal learning attempts and the reality. Simulation is one such way, and has been found to be exciting and useful in the fields of defence

research and training of managers. Simulation as a methodology is not quite new. About 1500 years back in India the game of chess was designed and played for the first time to simulate the strategic skills employed in planning of battles and wars. Since then games have been seen as one way of simulating some parts of the reality, which cannot otherwise be available to people who want to learn a strategy. Simulation became popular mainly during the Second World War, when it was widely used mainly by American Armed Forces, and by some other countries, in training people in strategic skills of aircraft manoeuvering handling of various complicated equipment, and making strategic and tactical decisions. Since then simulation has been employed both the study of managerial decisions and characteristics as well as for training of various managerial skills.

Simulation has been characterised by an attempt to imitate and create some dimensions of reality based on an understanding of inter-relationship governing it. Elgood (1976) distinguishes between three kinds of simulations: (a) conventional model-based simulation in which he includes simulation involving decision variables, puzzles, in-basket exercise, measures, enquiry studies including cases, and encounter games in which future is simulated and predictive model is used, (b) computer-controlled games, roles playing exercises and behavioural games (the main characteristic of these simulations being the gaming part), and (c) practical simulations.

Lovelock distinguishes between three types of simulations, based on the scope of simulation in business and industry: functional simulation (simulating only one function or two or three functions), company simulation (simulating most functions, but simulation being confined only to internal operations), and business or management simulation (simulation of competing and interacting companies). He also distinguishes between interactive and non-interactive simulations.

Twelker (1971) makes a distinction between media-ascendant and interpersonal-ascendant simulations for learning. The former are characterised by the use of mechanical devices and media, while the latter primarily simulate human interaction. Although the two need not be exclusive of each other (some simulations of human interaction can be done by the use of computers or media also), the distinction has some value.

What Twelker (1971) calls interpersonal-ascendant simulations can be called behaviour simulations. They simulate the processes of human behaviour, and interpersonal interaction is an important part of such simulations. Behaviour simulations are primarily focussed on the process, and learning of and about the process. Process is concerned with why and how of behaviour. For example, a behaviour simulation would focus on how decisions are made, and with what consequences, rather than on the decisions made.

Amongst behaviour simulations distinction can be made between exercises and games. Games have set rules, predictible result, hidden design to highlight or demonstrate a behavioural process, and they produce dramatic effect. The games arer quite effective in their purpose, but they cannot be played again and again. On the other hand, exercises simulate a process, with enough scope for improvisation, adaptation, and redesigning according to the situational needs. Some authors use the term "structured exercises' to denote all kinds of simulations (see Pfeiffer and Jones series).

Behaviour simulations for training and education were stimulated by two main developments - the results of simulation in social science research, and by increasing emphasis on and search for ways of helping individuals to experience psychological reality. Research on a non-zero-sum game, Prisoner's Dilemma, stimulated a lot of interest in this game in psychology (Rappaport and Chammah, 1965), and two very useful behaviour simulation games on trust, competition and collaboration were developed; Prisoner's Dilemma (Glass, 1977; Pfeiffer and Jones, Handbook Volume 3, p.52) and Win As Much As You Can (Pfeiffer and Jones, Handbook, Volume 2, p.62). Frederiksen's research with in-basket exercises ( ) has stimulated several in-basket simulations both for assessment and training. Many such examples can be cited.

Relevant Concepts of Learning

Every pedagogical device uses some principles and concepts of learning even if these are not made explicit. With changes in technology and evolution of human society resulting in different norms and expectations, the concepts of learning also change. Some recent work in the field of learning has necessitated search of new ways of organising teaching-learning activities. Simulations in general, and behaviour simulations in particular, seem to respond to these new emerging needs.

Graham and Grey (1969, Introduction) have mentioned six laws of learning underlying learning theories of 1940s. These are : the law of continguity, the law of effect, the law of intensity, the law of organization, the law of facilitation and interference, and the law of exercise. They have suggested the necessary changes and modifications in these laws as a result of recent approaches to learning. Essentially there seems to be some shifts in the emphases being given in learning: (a) from static or mechanical understanding of learning process to a more dynamic interpretation of learning, (b) from the concept of learning as a receptive process to that of taking learning as the process of discovery in which the learner is active, (c) from task-orientation to process-orientation or insight-orientation, and

(d) from standard approach to differentiated and individualised approach. In the past the focus of learning was acquiring of knowledge. This was regarded as a given task to be accomplished. The new emphasis of learning is on how to learn, and understanding the concepts rather than only acquiring them as items of knowledge. The shift from the standard procedure or esearch for the standard way of maximising learning to differentiated and individualised approach to learning emphasises learning as a process ofhhelping people to make choice. It is in this sense a liberating process rather than a conditioning process.

Greenbalt and Duke (1975) have stressed the importance of two types of communication human learning needs in contemporary society, viz. the need for modes of learning large quantities of information, and the need for modes of developing general comprehensions of some domains rather than detailed information about them. Both of these indicate the importance of "systems" awareness. They have, therefore, emphasised the need of using holistic insights in communication and learning.

New developments in the field of learning have primarily been contributed by Rogers (1969) by emphasising the importance of nurturing self-direction and fulfilment, Bruner (1966) by stressing

the importance of autonomy and self-reward and discovery as the main way of learning, and Freire (1970) by his emphasis on conscientization as the main goal of education. The shift in emphasis can be seen from coping behaviour to expressive behaviour (using the terminology of Bruner) or from prescriptive behaviour to liberating behaviour (using the terminology of Freire) or from direct influence to indirect influence, using the concept developed by Flanders (1970).

The relevant concept of learning for behaviour simulation relate to process of learning and managing the process more effectively. Pareek (1977) has listed the following 15 different conditions to make learning effective. For this purpose, learning has been defined as "the process of acquiring, assimilating, and internalising cognitive, motor or behavioural inputs for their effective and varied use when required, and leading to enhanced capability of further self-monitored learning" (Pareek, 1977).

1. Authentic and open system of training institution or the place of learning
2. Non-threatening climate
3. Challenging learning tasks
4. Collaborative arrangements for mutual support of learners
5. Organisation of graduated experiences of challenging successes
6. Mechanisms for supportive and quick feedback
7. Opportunities to practice skills learned

8. Opportunities to apply learning
9. Opportunities for and encouragement to self-learning
10. Opportunities for and support to experimentation
11. Emphasis on learning through discovery
12. Indirect and liberating influence by trainer/teacher through minimum guidance
13. Trainer's/teacher's human values and faith in man
14. Trainer's/teacher's high expectations from learners, and openness to examine own needs
15. Trainer/teacher competence

Behaviour Simulation as a Pedagogical Device

Although simulations have been widely used as pedagogical device in the military, industry and recently in education, the use of behaviour simulation is very new. In education and other fields role playing nhas been used for long for training in education. However, behaviour simulation in games and exercises has not been much used. These have recently been used as training devices in management education. Their pedagogical potential is quite high. In this section we review some relevant aspects of behaviour simulation as a pedagogical sdevice.

Types of Behaviour Simulations

Behavioural simulations can be divided into various categories according to several bases. We can distinguish the various simulations on the basis of the following four different groups.

1. Players Involved: The simulation may require an individual to play the game alone, or may involve two players, or several persons playing in a single team, or it may involve inter-team activity, or there may be an activity in which quite a large group is involved as a total organisation. We may thus have five kinds of simulation exercises or games according to the players involved.

2. Variables involved: Simulation exercises can also be divided on the basis of the number of variables used. In an exercise only a single variable may be used, or several variables may be used so that it becomes a complex exercise.

3. Orientation of the Simulation: Simulations can be divided into two categories, some being problem-oriented and others being experience-oriented. Problem-oriented simulations are primarily task simulations. Some tasks may be provided and simulation may be prepared to help the learner to understand how that task is done. In an experience-oriented simulation the main emphasis is on process, simulating various kinds of processes. Some of the processes which have been simulated in games are competition or cooperation, trust, encounter, decision making, resource utilization etc.

4. Purposes of Simulation: Simulation exercises can also be classified according to the purpose for which an exercise is designed and used. There may be four different purposes. (a) A simulation exercise may be designed and used primarily to demonstrate some process or some aspect of learning. (b) It may be used primarily for providing cognitive learning about certain processes. (c) Simulation exercises may be used to develop insight into the behaviour, or to change orientation or attitudes of the players. Usually such simulation exercises provide a shock to the learners to jolt them into realising what kind of behaviour they show. Such simulation is used to create cognitive dissonance as the main basis of learning and change. (d) Simulation may be used to give practice in certain skills. Very good examples of such simulations are given in Miles (1959).

Elements in Behaviour Simulation

Behaviour simulations involve several dimensions. The following are the main elements in the various exercises and games designed and used.

1. Objectives: It is necessary that the designer of the simulation and one who uses simulation with a group is clear about what the main objective of the simulation is. This objective may be in terms of the

purpose of simulation : whether it is to demonstrate certain ideas, or provide cognitive learning, or give insight into behaviour, or provide opportunity for the learner to practise skill etc. The objective may also be stated in terms of the specific outcomes which are expected from the simulation exercise.

2. Cognitive Framework: A simulation exercise should be based on a clear understanding of the cognitive linkages between various elements involved. Every simulation exercise has an underlying cognitive model. Simulation may not be effective and successful unless the cognitive framework is clear. The cognitive framework provides the designer of the simulation enough opportunities to simulate the various dimensions effectively. Bloom (1976) summarising researches on learning shows the importance of student attention to academic activities, those which they perceive as resulting in cognitive learning.

3. Variables Simulated: A simulation exercise simulates either the thought process, or a behaviour process, or some elements in group work. The designer as well as the user of the simulation exercises should be quite clear about the variables which are involved and which are being simulated.

4. Roles: All behaviour simulation exercises and games involve some roles which the learners or the participants take and play during the simulation exercise. These roles are designed according to the purpose and the nature of simulation.

5. Interaction: All behaviour simulations involve interaction usually amongst people, or if the exercise is being played by an individual alone, then between him and the simulated roles.

6. Rules for Behaviour and Interaction: Simulation exercises pre-determine what rules will apply to the behaviour and interaction amongst the various roles and participants involved. It is determined in advance that certain things may be permitted and certain other things may not be permitted. This is done to make simulation effective. Such control of certain variables is necessary for directing and channelising simulation into a specific way.

How to Use Behaviour Simulation

Several elements are involved in the use of simulation games and exercises. To make these exercises effective for purposes of learning of various kinds it is necessary that due attention is paid to several aspects. The following suggestions are made in this regard.

Facilitator: Facilitator plays the crucial role in behaviour stimulation. The facilitator plays several roles and guides simulation according to its purpose. He is a resource of expertise on a particular topic which is involved in simulation. He also plays the role of theory building, in the sense of evolving a cognitive model out of the experience which people have by relating various elements which emerge out of the experience into a meaningful cognitive understanding. This would mean that the facilitator integrates experience and data generated by experience with the cognitive elements involved. The cognitive elements do not hang loose, separated from each other. On some occasions, the experiential data may not necessarily fit into the cognitive framework which the facilitator has prepared, and is ready to use at the end of the exercise after the data are generated and discussed in the group. On such occasions the ingenuity of the facilitator in weaving the data into a cognitive framework showing the various inter linkages is crucial. The author's experience is that such occasions provide the most thrilling moments for insightful understanding and creative theory building about the experience generated. The facilitator as a theory builder should be well read in various theories, as well as should be creative so that he is prepared for rethinking and his current knowledge does not necessarily freeze him

into inactivity if the data generated is quite different from the expected data. The third role of the facilitator is that of process facilitating. This role is an important role in making simulation effective for behaviour change. The facilitator uses simulation to help the learners become aware of certain behavioural processes, and thereby facilitates behavibural change. The fourth role is the managing and administering role, making necessary arrangements and seeing that simulation exercise is conducted according to the plan. The role of the teacher/facilitator is very important in organising learning activities. In the area of learning of basic skills in reading and arithmetic Rosenshine (1978) has found academic engaged time as the most important factor in learning. This seem to be true in other areas also.

2. Participants of learners: Although the simulation exercises or games are constructed with predetermined rules, and several variables are determined and controlled in advance, the participants or learners should have enough freedom to respond to situations in their own way and learn by their experience. Without such freedom the simulation may merely result in game or exercise which may not lead to experimentation of behaviour on the part of the participants.

3. Insight learning: It is necessary that behaviour simulation produces/in learners. This is possible when the learner is involved in the simulation through his behaviour, is able to see the consequences of his behaviour and the results obtained. As already stated earlier, one of the roles of the facilitator is to process the data of behaviour generated in the simulation so that the learners are able to see the relationship between what they did and their consequences in terms of simulation.

4. Cognitive learning: Behaviour simulation should also result in cognitive learning. If simulations are used merely to provide experience, and necessary insight to participants without tying the experience in a cognitive framework which explains what the participants experienced, they may remain only exercises of behaviour modification. Some facilitators do this by providing simulation experience to the participants and then leaving the participants to draw their own conclusions. In the opinion of the author, however, the purpose of behaviour simulation is not fulfilled unless the cognitive framework emerges and the facilitator concludes by summarising the cognitive framework. He may certainly not give the cognitive framework himself, and may elicit the necessary learning from the participants by asking appropriate questions. But his responsibility

to derive cognitive learning and to help the participants see cognitive connections amongst various elements of experience in simulation cannot be neglected.

5. Flexibility: Behaviour simulation should not become a routine exercise or a ritual. In many cases the exercises or games may be followed by the facilitator without exercising his own judgement and creativity. As already discussed, the facilitator needs to exercise his own creativity. He may innovate the rules according to the changes occurring in the group. He should also feel free to drop some part of the simulation as the exercise develops and if he feels that this may be required. However, it should be made clear that only a facilitator who has had enough experience with such simulation exercises and who has developed enough self-confidence and insight in his own behaviour may feel free to do so; and then freedom may be creative. If, on the other hand, the facilitator uses his freedom only to escape out of the difficult situation developing in the simulation, he is misusing his freedom. The distinction should, therefore, be made between flexibility as a convenient way of getting out of some difficulties, and creative flexibility which enhances the value of simulation and adapts it to the need of the situations.

5. De-briefing: One of the criticisms against some simulation games and exercises is that exercises are designed without the knowledge of the participants as to what processes they are being exposed. An ethical question is raised about the propriety of doing something with a group about which the group is not aware. If an exercise is used as a diabolical measure to produce change in people, and people do not know about it, this becomes unethical. One important dimension, therefore, of behaviour simulation is sharing the rationale and the purpose of simulation after the simulation is over. This may especially be necessary in exercises in which conflicts, competition, trust etc. are simulated, and interpersonal trust or lack of trust, cooperation or conflict are generated as part of simulation. The participants should be debriefed about the entire exercise after data have been collected through questions and interviews with those who participated. Debriefing becomes a necessary part of simulation in which attitudes, values, behaviour etc. are involved.

Designing Behaviour Simulation

Several steps will be involved in the designing of behaviour simulation. Thosewho have worked with simulation for purposes of education and training have defined ways of designing simulation. Twelker (n.d.) has given 13 specific steps in designing instructional simulation systems as follows:

1. Define instructional problems
2. Describe the operational educational system
3. Relate the operational system to the problem
4. Specify objectives in behavioural terms
5. Generate criterion measures
6. Determine appropriateness of simulation
7. Determine type of simulation required
8. Develop specifications of simulation experience
9. Develop simulation system prototype
10. Try out simulation system prototype
11. Modify the simulation system prototype
12. Conduct field trial
13. Make further modification to the system on the basis of the field trial.

Walfort (1971) mentions four major phases of the building process of geographical simulation, and these may apply to other simulations also. They are as follows : (1) Identification of the concept or process which it is desired to simulate, (2) Considerations about the general nature of the simulation - should it have rules or be unstructured, should it be a practical kit or theoretical exercise controlled by the teacher etc.? (3) Construction of the rules and framework of the game. Participants should be identified,

their ultimate objective specified, and the methods on interaction in each round of play worked out. (4) Comparison of the finished simulation with the reality which is desired to simulate. But if this is not satisfactory the simulation should be redesigned or scrapped.

Duke (1974) has discussed in detail the process of designing a game in four phases : initiation, design, construction, and use. The process is discussed as a gestalt, and a 'wheel' model has been suggested to indicate the circular nature of the process, and the importance of various sub-parts.

Pedagogical Value of Simulation

Behaviour simulations have similar advantages as other types of simulation. One main advantage of such simulations is that they make it possible to control some aspects of human behaviour, to be able to focus on and deal with some others. Simulations take the behaviour out of its natural setting and recreate it in an artificial way. They also exaggerate and dramatise some aspects of behaviour. Both these characteristics may be cited against behaviour simulations.

But these, in fact, are their advantages. Study of a phenomenon can be facilitated by bringing in into a bold relief. Phenomena are depicted on a much larger scale than their natural states. While behaviour simulations in a restricted view are far away from reality, they bring the participants much closer to psychological reality by clearing the way for them to experience what they are prevented to experience (and kept away from experiencing) by the overwhelming reality in every day life. After they have been helped to see a part of the reality in bolder relief, their ability to perceive and experience it in every day life is enhanced.

Several studies have been reported on the pedagogical value of simulation. The most rigorous studies have been reported from the use of simulation in the military situation. Such studies have been summarised by Carroll (1978) and by Twelker (1971). These studies show that simulation has been found useful in the military in providing training of various kinds. This includes also transfer of training from simulation to real life situation. The advantages include low cost training, comparative safety etc. Simulation has been increasingly used and found valuable in various such settings. All these studies have been primarily made on what Twelker (1971) calls media-ascendant simulation. Reviewing various studies,

Twelker (1971) points out the following learning outcomes of media ascendant simulations : (a) cognitive outcomes (principles and relationships, decision-making skills, identification of important cues and symbols, procedural sequence, skilled perceptual-motor acts), and (b) affective outcomes (involvement, emotion, and attitudes towards self, others and country). He mentions the following advantages of media-ascendant simulations : reproduceability, planned variation, realism, integration of psychomotor and perceptual learning, learner competence, traditional teacher control over students, cost of training, safety of personnel, effectiveness of learning, availability of rare events, ease of experimenting with new procedure, measurement of readiness, availability of operational equipment, damage to the operational situation.

A recent report from an airlines company based on the survey during 1976 has indicated that the use of a simulator saved more than 6,830 flight hours, and saved more than 11.5 million gallon of jet fuel only during one year (anon, 1977). All these advantages and achievements of simulation are primarily of those simulations in which costly equipment was used.

Allen (1971) has reported findings from non-simulation games he has used with students to show that continued use of non-simulation games by students resulted in an average increase in non-language IQ scores on the California Test of Mental Maturity during a three-week interval, and the gain was 20.9 points. This was in comparison to the gain of the control group during the same period of 2.1 points. Thus, there was clear evidence that the use of non-simulation games increased the level of IQ in the students who played this game.

Cherryholmes (1966) summarised the effectiveness of stimulations and indicated that the pedagogical advantage of game like activities is that they seem to promote the discussion of quite predictive type. Boocock (1968) in Johns Hopkins University has been reported by Goodman (1973) as finding that more realistic attitudes towards politics developed in the high school students who participated in an election campaign game. Frederiksen (1962) found in-basket exercises quite effective in improving administrative performance of the participants. Goodman (1973) quotes the results of the study by Cohen published in 1970 by the Johns Hopkins University showing that a group of uninterested unmotivated truants were motivated to attend school by playing "consumer game".

The most relevant findings for behaviour simulation may be from simulations and games used in management and business training and those used with teacher education. Schriesheim and Yaney (1975) reported no difference when rigorous research was done by controlling the motivation gain, for simulation as compared with other methods in business education. Schriesheim and Schriesheim (1974) analysed about 100 books and articles out of a total 400 published on the use of simulation in business, and they made a detailed content analysis of 25 of these books and articles to find out if simulation reported to have produced positive results or negative results or non-positive results. There is a large support that simulation favourably influenced decision making skills. Planning and forcasting skills were much more increased compared to other skills. Regarding some other skills the literature does not seem to indicate very clearly that simulations have more advantages than other methods.

The advantages of simulation for teacher education have been very well summarised by Cruickshank (1971). Reviewing various studies made on the use of simulation in teacher education, Cruickshank summarises the following main advantages of simulation:

(1) Simulation establishes the setting wherein theory and practice can be joined. (2) Simulations force students to take action and bear resulted consequences. Cruickshank quotes Carl Rogers that the students find it necessary in simulation to make a personal decision based on the information available and bear the responsibility for the consequence of the decision and the action taken. (3) Simulations are relatively safe. (4) Simulations are psychologically encouraging. (5) Simulations promote control. (6) Simulations broaden the training horizon. (7) Simulations are relevant. (8) Simulations enable the student to be himself. (9) Simulations seem to work. In this regard the rigorous findings based on highly controlled and sophisticated design of a study by Cruickshank and Broadbent indicate that "simulation training when tested under the most stringent conditions was an unqualified success as a teaching device that motivates and involves students and that, although simulation was only partially successful in changing the student teacher behaviour, it was atleast as effective as an equal amount of student teaching."

Krause (1970) has reported that the teachers of an experimental group who used the behaviour simulation showed significantly greater understanding of the child's hidden goal or motivation for behaviour. No difference was, however, found between the experimental and control groups in their ability to discriminate the more suitable or verbal response.

A review of 29 studies on effectiveness of education simulation for changing attitudes (Heitzmann, 1976) has concluded that the majority of the research findings indicate that the simulation games have proved successful in producing positive attitudes towards as issue the game has simulated, in improving participants' attitude towards learning and the school system in general, and in influencing students' attitude about their own effectiveness in their environment.

Garvey (1971) has extensively reviewed the reports of the advantages and uses of simulation, and based on such an extensive review, he concludes that although there is no clear proof based on sophisticated research designs that simulation is more effective as a method for cognitive learning, simulations have been found to have several advantages by those who have used them. These include the following:

1. Motivating students: Enough evidence has been collected by those who have used simulation that such methods create higher motivation amongst students.

2. Affecting student attitude: Again reports by several investigators and experience of those who have used simulation indicate that the student attitudes are influenced at least in three areas. In the first

place the students' view of their own abilities change, and they begin to recognise and realise their own potential. In the second place, students' attitude towards games and simulated situation change. And thirdly, their attitudes change in terms of their expressing more realism after simulation experience.

3. Facilitating the acquisition and retention of knowledge: In this regard although some impressions of those who have used simulation have indicated that the participants in simulation exercises receive considerable reinforcement because of the intensity of application and concentration, there is no clear evidence that simulation is a decisively better method for acquisition and retention of knowledge. Garvey has reviewed two experiments with some empirical evidence indicating that simulation was found to be more effective in the learning of what is variously termed principles or concepts.

4. Developing social skills: Simulations seem to be most effective in this regard.

5. Providing laboratory experience: Simulations have been reported to be very effective in this regard also.

Based on the extensive survey of various researches Garvey concludes that although there is no evidence from well done experimental research about the superiority of simulation as a method in acquiring and retaining knowledge "there is no room for doubt that simulation possesses some solid advantages for use in education".

Goodman (1973) emphasised the importance of enjoyment in learning. "For decades educators have definite approach to learning that recognises the consummatory side of problem solving, the sense of satisfaction that is 'consumed' at the moment of doing, quite apart from the residual, instrumental benefits which may accrue for having solved the problem. The sense of closure that is possible in a formal learning activity such as a game may be of great value in bringing a student to an appreciation of joys of learning in its own right... Lest these 'joys of learning' be merely the satisfaction of dominating another person, researchers have the additional obligation to search for harmful side effects for irresponsible competition."

Goodman quoting Cherryholme (1966) suggests that an alternative may be to focus on learning by designing games than on learning by playing games alone. He also comments on the search for the advantages of such games. "But the appropriate research postures

seems to be to determine when formalisation of learning helps and when it hinders learning, not a posture calculated to demonstrate the overall superiority of one or the other." This is an important aspect to keep in mind while searching the advantages and values of simulation. Simulations have their own role to play and should not be considered as supplanting any other pedagogical methods. They should certainly supplement other methods and improve the quality of learning.

Wolfe (1976) has reviewed the various reports and studies on effectiveness of simulations for teaching business policies. His findings are relevant for behaviour simulation, indicating their usefulness for specific areas. He concludes "Based on the evidence, simulations as business policy teaching aids or environments appear to be effective devices for inducing an understanding of the need for basic strategies, goal-setting, and the behavioural problems involved in organizational decision making. The use of simulations does not appear to encourage a deliberate and objectively analytical approach to strategy making and organizational structuring nor does it lead to the generation of systematic control or management information system."

He indicates that simulations are useful for some aspects and not for some others. Several authors have suggested the use Programmed Instruction (PI) model (Greenlaw and Wyman, 1973 and Wolfe, 1976) for evaluation of pedagogical value of simulations. This model originally suggested by Campbell (1971) requires an initial specification of the desired academic outcomes or terminal behaviours; the de-composition of the learning tasks into structural components; and an assemblage of teaching tools and methods capable of eliciting the outcomes and behaviours specified.

Resource Material

Simulation is being increasingly used in several areas of education. Some handbooks provide information about simulation games and exercises. Graham and Grey (1969) have provided a classified list of important business games (50 general purpose, 50 special purpose and functional, and 52 industry games) available in USA. They give detailed information about each game (description, training purpose, decisions made by the participants how game is administered, sources of information) as well as a list of organisations where these are available. Elgood (1976) similarly gives some details about 80 simulation material available in Britain. Details about the material are also given along with a list of resource organisations. Twelker (1970) has listed some games and other simulation materials.

The second encyclopaedia of research on teaching has included review of simulations in education (Goodman, 1973). The most useful book for education is the one edited by Tansey (1971). Several chapters in that book review the use of simulation in education and provide the necessary information about available simulations in teaching arithmetic (Atherton, 1971), geography (Walford, 1971), international relations (Smoker, 1971) and teacher education (Cruickshank, 1971). Tansey and Derick (1969) discuss the use of simulation in education. Zuckerman and Horn (1970) have edited a resource book on games that can be used in education and training. Boocock and Schild (1968) have also provided material for such games. Guetzkow (1962) and Youngers and John (1969) provide materials on various aspects in social science. Birt (1975) provides information on simulations for teaching history. Guetzkow, et al (1963) have given details of various simulations of international relations. Alger (1963) has reviewed this for undergraduate teaching.

Some recent materials give useful information about the use of simulation in various areas. Maatsch et al (1976) have reviewed 224 publications in simulation with implications for medical education. Weaver (1976) gives information about simulation material which can be used for library personnel to learn skills in negotiation, decision making, budgeting and programme planning. Steinwachs (1977)

gives some details about simulation material on urban environment and social problem. Simulations have been used for teaching group membership roles to teachers (Anderson 1977), for training in banks (Rtb and Scott, 1966), dairy management (Babb, 1963) and public relations (Simon, 1973). Simulation material have been developed for professional education to give secondary and post-secondary teachers skills in using simulation technique in teaching at Ohio State University (Anon, 1977). Simulation of administrative performance (Frederikson, 1962) has stimulated various other studies.

Recent interest in behaviour simulation has stimulated publication of games and exercises. Pfeiffer and Jones have started regular publication of handbooks of exercises and games. So far, six volumes have been published. Since 1972 they have been publishing annual volumes containing several games and exercises as well as conceptual material which are relevant to behaviour simulation. They call these structured exercises for group experience and human relations training. Nylen, Mitchell and Stout (1967) have given several exercises and conceptual material which have been widely used. Simulation exercises which have become popular and have been widely used are in areas of interpersonal cooperation (broken square, Pfeiffer and Jone, V.1, p.25),

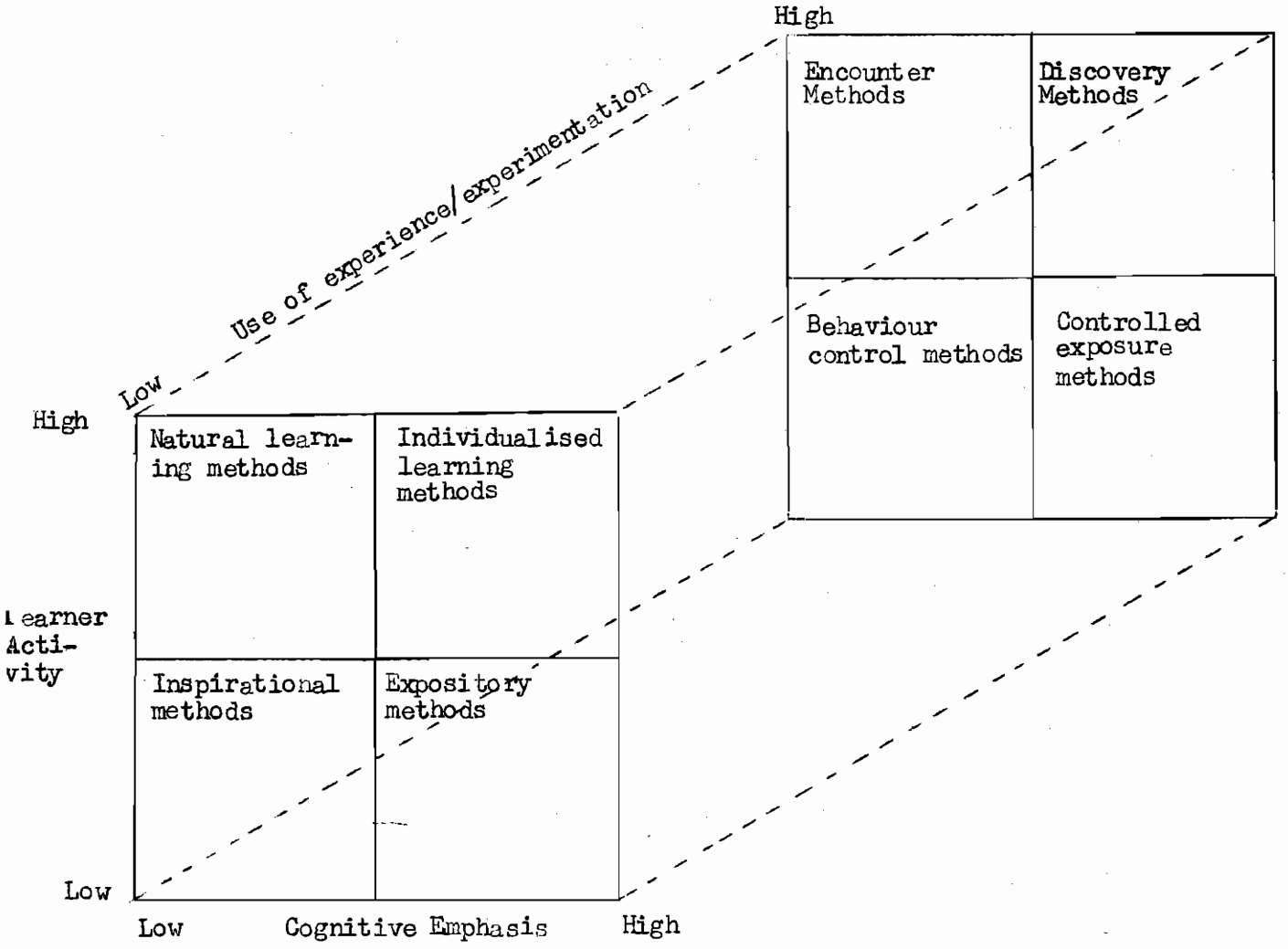
interpersonal communication (Hollow Square, Pfeiffer and Jones, V.2, p.32), leadership (Hampshire Inbasket, Pfeiffer and Jone, V.2, p.41), group problem solving and decision making (Lost at Sea, Pfeiffer and Jones, Annual 1975, p.28, Wilderness Survival, Pfeiffer and Jones, Annual 1976, p.19; consensus Seeking, Pfeiffer and Jones, V.4, p.51), competition-collaboration (Win As Much As You Can, Pfeiffer and Jones, V.2, p.62 and Prisoner's Dilemma, Pfeiffer and Jones, V.3, p.52).

In several countries experiments in simulation exercises and games for training are continuing and more and more material is being generated. Several journals have shown interest in this new activity. American Behavioral Scientist has devoted several issues to simulation and games. A new journal Simulation and Games : An International Journal of Theory, Design and Research is publishing material on simulation and includes reviews of recent simulation material. It is published quarterly. Strategy and Tactics contains in each issue a conflict simulation game, and articles and reviews of current simulation material. A newsletter has also started publication to facilitate communication amongst people interested and involved in simulation.

Behaviour simulation is a promising and exciting field. It can profitably be used in education mainly for developing attitudes, orientations and values, and much more widely in teacher education for developing new values and behaviour. In the years to come more material will be published. Several years back Miles (1959) published simulation exercises which stimulated interest not as much in education as in the field of management and organisational behaviour. Probably the time is ripe for behaviour simulation to be used more extensively in the field of education.

Figure 1

Typology of Pedagogical Methods



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