

Morry van Ments

USING SIMULATION IN INDUSTRIAL TRAINING

When looking at ways in which simulation and gaming can be used in industrial training, it is useful to consider ways in which industrial training compares with general or academic education.

Knowledge

When preparing for an examination it is usually possible to define the syllabus and learn everything needed for the examination. No-one in industry can hope to learn everything they will need for their job for all time. It is much more important to know how to get information and to be able to absorb it quickly from others.

Skills

In both education and training there is a need to develop mental and physical skills. In a school or college the practice environment, that is the task and the resources provided, are structured so as to remove all extraneous interference such as noise, inaccurate instruments and dangerous situations.

This concentrates attention on the particular skill to be learnt. Just as it is easier and safer to teach someone to ride a bicycle on a playground or quiet road, so it is more efficient for example to teach someone to repair breaks in weaving thread using a thick thread and away from the full-scale machine. Managers can be taught their skills in the same way, by presenting them with situations to control which are away from the complexity of their real jobs and where mistakes will not hurt or damage other people.

Relationship with the real world

On the other hand it is important that industrial training keeps its feet on the ground and is not carried away by academic theory or teaching material that is interesting but not relevant to the problems the student will have to cope with in the outside world.

Teaching methods for industrial training must ensure that students see the connection between what they are learning and their job. Even better, it should automatically allow for a continuous interaction between teacher and students so that the latter can question and even change the direction of the training to fit their needs.

Attitudes

Whilst much of conventional education is concerned with the acquisition of skills, techniques and knowledge, much of industrial training involves changing attitudes. Knowledge of facts is not difficult to come by, nor are mental and mechanical skills particularly difficult to acquire. It is much more difficult to change attitudes towards problems, towards people or towards the constraints and opportunities that surround us. Yet our attitude towards these important elements deeply affects the way in which we cope with the job in hand.

Use of simulations and games

Industrial training then has a somewhat different slant towards knowledge and skill than has traditional education. Moreover the student is usually required to operate in a highly complex environment and is likely to have considerably more experience of his or her work than has the trainer.

A set of techniques is needed which enable students to draw from their own experience and try out their ideas within a framework which provides the important elements of their environment without including those leading to danger or unnecessary complexity. Simulations and games are such techniques. They provide a means of letting students learn from a structured situation whilst at the same time allowing them to put into the situation some of their own problems and ideas.

I shall consider them in three broad categories a) Those which use hardware i.e. electrical or mechanical equipment, models etc. b) Those which model a system, possibly using computers c) Those which model a human interaction. These categories are not mutually exclusive; there is considerable overlap. I shall concentrate mainly on the last group since this is the area of most interest to me, and presumably the readers of this journal.

a) The hardware model

The use of simulation is not new. War games have been used for training purposes for a considerable time. A three dimensional model with troops, equipment, guns and vehicles is manipulated by each side - traditionally the blue and red sides - according to a framework of rules. These rules can be very complex and the game may run for days using playing manuals and numerous umpires and games directors. A more constructive recent development of this idea is the disaster game. This is used to train people in the problems of planning and management of natural and man-made disaster situations in developing countries. Another group of training aids which rely on expensive and elaborate machinery are simulators used to train pilots, originating with the old Link trainer. Again, this idea has been developed recently to encompass simulators for the operation and control of nuclear power stations and those which mimic the operation of oil rigs including hazards such as blowouts or fire. The idea in each case is to provide training for operators where a mistake or error of judgement could be costly or result in danger to others. The costs vary from the multi-million simulators described above to a leather and wood contraption used to simulate calving at an agricultural college.

b) The systems model

Just as simulators were developed to give workers experience of equipment without incurring the disastrous results of mistakes, so the business simulation has been developed to enable managers develop their decision-making skills in an environment where the consequences of wrong decisions are not as serious as in the real world. Furthermore it gives them the opportunity of trying out various business strategies and comparing results.

In these simulation games the student may work as an individual or as a member of a team. The individuals or teams compete against one another in a series of rounds which represent part of a business cycle taking days, weeks or months. The rounds themselves may take from half an hour up to several hours to play and the whole game may last a morning or many days. In each round the participants have various decisions to make about such things as marketing, size of workforce, level of stocks, taking on new products. The results of their decisions, which of course are affected by the decisions of the other teams, are fed back to them after varied inbuilt delays.

After several rounds the participants meet together to analyse what has been happening and to learn from each other's mistakes.

Business games come in two basic formats. Firstly the games which concentrate on the financial and quantitative aspects of decisions. These are often supported by computers that carry out the calculations at the end of each round; in some cases the computer virtually runs the simulation. Secondly there are games which model the communication processes in business. These centre around messages, memos, telephone calls and meetings where information is exchanged and decisions taken before the next round is set in motion.

c) Human interactions

This covers a wide range of simulations ranging from exercises designed to enable the individual to appraise his performance, to large-scale exercises which simulate large gatherings of people. In some ways these form a progression and I will therefore deal with them roughly in order of increasing size and complexity.

(i) In-tray exercises and action mazes

For an in-tray exercise the trainer gathers together twenty to thirty items or mini-situations which for the purposes of the exercise are translated into telephone messages, letters, memos, notes, forms and other documents. Students are asked to imagine themselves in a situation where they have to deal with this stock of problems within a limited time, usually one hour. They have to make decisions, connect together seemingly unrelated problems, decide on priorities and what to ignore. In the discussion afterwards students discover that what might have been straightforward decisions to them present an ethical problem to others; they learn that people have different styles of coping with stress, and a little about their own styles.

In the action maze the student can again be asked to work on his or her own initially and then compare their approach with others. S/He is presented with a minor crisis - someone turning up late for work several times in succession for example -, and is given a number of options for reaction. The maze is presented in the same format as a programmed learning text, that is to say that when a particular choice has been made the students are directed to another page which gives them the result of their decisions together with another problem that follows from

it. Again the student is presented with a series of choices, again s/he is directed to another page for the result of his or her choice.

The skill of writing an action maze lies in the way in which different situations and decisions can be shown to lead back to the same results. In other words the dynamics of the external situation are such that we cannot always make the truly free choices we think we can. In the maze the student can discover, without feeling threatened, that there are layers of understanding and that overt behaviour is not always the guide to other people's motives. In some mazes they discover that it is possible to get trapped in a loop, a vicious circle of misunderstanding; in many cases they learn that there is no neat solution. Often they find when the de-briefing discussion takes place that the shortest route to the solution has left them ignorant of many hidden factors of which their colleagues, who took a longer, more sensitive route, have become aware.

(ii) Role-play

From the non-threatening and slightly impersonal field of in-trays and action mazes it is only a short step to represent problems not by pieces of paper or pages of a text but by real people who imagine themselves into the particular situation and act it out for themselves. A short step, but clearly a major change in approach since this brings into play all sorts of potential threat and hang-ups about middle-aged managers 'acting'. In practice however, with a skilled and sensitive facilitator these problems are greatly reduced whilst the benefits of being able to study a real live situation are enormous.

This is not the place, nor is there sufficient space to write at length about the techniques of overcoming the natural fear and resistance to role-play often found with students from industry, or indeed elsewhere. The important point which must be grasped is that normally the student is not being asked to pretend to be or act like someone else. S/He is asked to imagine him or herself in a situation which automatically puts constraints on his or her behaviour. If the role is that of a member of staff, manager, shop steward, a child, teacher, illiterate, in each case there will be things which by physical or mental constraints, or by the framework of social convention, or by the amount of knowledge and experiences s/he would have, the student

can or cannot do. Clearly, one of the things which the role-play may reveal is what the student **thinks** are the operating constraints of being a manual worker, a secretary, a disabled person, a man or woman.

There are many ways of writing the background briefings for role-plays but in general the less detail the better. The great advantage that role-play has over more mechanical devices is its flexibility and the players should be allowed freedom to explore those aspects of the situation which interest them. There are a number of techniques available for enabling role-plays to run smoothly. Most of them rely on bringing in other members of the group to 'help-out' the role-players. The experienced facilitator also knows that it is much easier to stop and re-start a role-play than the novice imagines. A golden rule in starting the debriefing discussion is to firstly ask the role-players themselves for their observations before inviting comments from the observers; this usually removes the threat element from debriefing.

(iii) Simulated interviews

Role-plays can be used for a wide range of informal or casual situations. The more structured types of role-play fall into the categories of interviews and meetings. Here the purpose of the role-play is more complex. In addition to trying to get an understanding, a 'feel' of what is going on inside the person s/he is talking to together with an awareness of what it is like to be inside the role which s/he himself is playing, in an interview the student is also coming to terms with a conventional structure which introduces its own hidden rules and conventions. Where the furniture is placed, who writes what and when, become important signs and symbols. The interviewer and interviewee will each have multiple objectives and the whole process can resemble the balanced rhythm of a game or minuet.

By simulating selection, appraisal or disciplinary interviews the participants can explore different approaches and experience some of the problems in a safe environment. Many people may only have to deal with these situations a few times and quite apart from ethical considerations they do not have the opportunity to learn from repeated experience. In a real-life situation moreover they will not normally get feed-back on how they performed - certainly not from the horse's mouth as it were!

The interview simulation enables participants to rehearse their behaviour and correct or improve it before they have to practice it in their job.

(iv) Simulated meetings

As the number of people involved in the simulation increases and the potential complexity of interaction increases, so the purposes of the training exercise begin to shift. In the one-to-one situation the emphasis is on acquiring an in-depth understanding of your own and your colleague's motives, reactions and behaviour. During a meeting there are so many other things to observe which relate to the structure of the meeting, its overt and covert objectives and its dynamics that one has perforce to look at the individual behaviour at a surface level or risk being bogged down in detailed analysis of individual personalities. It is important for the trainer to keep in mind the purpose of the training session, and a simulated meeting, whether structured formally or informally, is best used to study the politics, communication and dynamics of the conventional meeting. This is not to deny the place of T-group, encounter, gestalt or other types of training groups. The point is that their function relates more to the development of the individual and their group structure is therefore tailored to fit this requirement. In the simulated meeting the important thing is to obtain an accurate reflection of the features of the meeting itself so that students can both study the context and their place within it.

As with any simulation technique, trainers can to some extent control what is learnt by the way in which they structure the simulation itself. There are nevertheless a number of aspects of meetings that display themselves, however the meeting is structured. Foremost amongst these is the question of leadership and the extent to which the formal leader controls the meeting. Students are made aware of the way in which the type of leadership changes and with it the person who fills that role. The other major point which seems common to all these simulations is the way in which the purpose of the meeting may be to make decisions, to share information, to get agreement and support, to coordinate action, to ventilate grievances etc. or a mixture of these. It becomes clear to the student how important it is to clarify these purposes, and how seldom this is done. Comparisons may also be made between different types of meetings.

Some examples are committee meetings, informal meetings, project meetings, negotiating or bargaining meetings, press conferences, and public meetings. But this last type deserves a section to itself.

(v) Public meetings

The importance of the public meeting as part of the democratic process has long been realised by schools and there are a great many published simulations which use the public meeting as a vehicle to develop pupils' powers of communication and at the same time alert them to the impact of outside agencies on their environment. These simulations have titles such as Spring Green Motorway, Power for Elasky, the Power Station Game, and their titles express their areas of concern.

Industry has been slow to realise the place of the public meeting as part of its activities. My own department at Loughborough uses simulated public enquiries as part of its teaching material on industrial pollution but there seems to be little formal teaching planned within most training departments on the use and abuse of public meetings. I find this surprising since the day is long since past when people could safely say "Oh, that belongs to our public relations department; I shall never be involved". After all we now have training schools teaching such diverse groups as clergymen and military commanders how to make the best of themselves when appearing on television interviews. In view of public anxiety and awareness of the interaction between industry and the environment it is increasingly likely that workers and managers in industry will find themselves involved in public meetings.

These then are the broad categories of simulation which are used for training in industry. I have said little about the specific techniques which are conducive to an effective use of these simulations. The writing of efficient simulations, the use of closed circuit TV, the briefing and de-briefing of participants and the way in which a simulation must always be seen as an integral part of a training or development programme - these are covered by the articles and books listed in the bibliography.

The importance of simulations and games as teaching techniques lies in their emphasis on the human aspects of situations. They deal with people's reactions to complex, fuzzy circumstances which are becoming more frequent and important with the growth of information

technology and are the type of situation in which humans operate much better than computers or machines; they usually require an understanding of how other people behave and therefore tend to develop uniquely human aspects of the students and help them to unfold their potential to the full.

Simulations and games also help to make connections in people's minds between the numerous factors which contribute to any situation or problem. They enable students to practise and apply skills whilst getting immediate feedback of results. They are particularly powerful in changing attitudes because students are learning for themselves in contrast to more didactic forms of teaching. Above all they are highly motivating and can be great fun. What more would anyone want?

Most of the material published about the use of simulations and games has been published in America. The main exception to this is the material published in Britain by the Society for Academic Gaming and Simulation in Education and Training (SAGSET) and their co-publishers Kogan Page. Rather than give detailed references throughout this article to specific items I have gathered together some material as a bibliography at the end.

The author is the past Chairman of SAGSET and Assistant Director of the Centre for Extension Studies, Loughborough University of Technology. Information about SAGSET can be obtained from SAGSET (H), Centre for Extension Studies, Loughborough University of Technology, Loughborough, Leicestershire, U.K.).

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