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Conversational Science and Advanced Learning Technologies (ALT)

Designing Tools for a Conversational Pedagogy based on Self-Organised Learning

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CENTRE FOR THE STUDY OF HUMAN LEARNING

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Conversational Science and Advanced Learning Technologies (ALT):

Designing Tools for a Conversational Pedagogy based on Self-Organised Learning

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DEDICATION

Gordon and Laurie ran a regular fortnightly post-graduate seminar at Brunel over a period of twelve years. This was a continually stimulating experience for all concerned. In many ways what developed was a twelve year learning conversation between a core group comprising Gordon with his team (Systems Research) and Laurie with members of CSHL (Centre for the Study of Human Learning). We were certainly stimulated to pursue all sorts of issues and to learn many things. Over the years scores of additional cyberneticians and psychologists joined in. They contributed, often silently. Some retired hurt and baffled, but most became deeply involved. Despite differences, in temperament, in our psychologies and in our approach to conversation, Gordon and Laurie, and later Sheila, became close, working together on related topics at the Admiralty Research Laboratories at Teddington and eventually offering a three-day joint Systems Research and CSHL workshop and symposium to the BPS Annual Conference.

We learned much about the value of a conversational approach, partly from Gordon's theorising but more fundamentally from reflecting upon the experience of sustaining this joint seminar through its highs and lows.

In Gordon's own words "in their work on Learning Conversations, Laurie and Sheila have added to conversational theory and practice and independently innovated along directions congruent with mine, although expressed in their own metaphor................. ". Laurie still converses with Gordon and in many ways we both believe that he still converses with us.

This paper is dedicated to Gordon in gratitude for his challenges which provoked us into our research, insights and understanding of, what is for us, the true nature of a 'conversational approach'.

ON SCIENTIFIC METHOD

In the twentieth century mankind has made sustained attempts to apply 'scientific method' to investigations in many areas of human knowledge, areas well beyond our studies of the inanimate physical world where the term originated. Biological studies, anthropological, social and economic studies, cybernetic and psychological research are all examples of this trend. All have tried to use the Scientific Method. Few of these attempts have been completely successful. In each area researchers have eventually had to change, adapt or re-create their own forms of 'scientific method' before their methods began to yield the quality of results and understanding that these researchers were seeking. N. Tinbergen (1953) and K. Lorenz (1974), M. Mead and G. Bateson. (1980), G. H. Mead (1934) and J. Dewey, J. M. Keynes (1936), K. Lewin (1935), R. Ashby (1964) and G. Pask (1973), C. Rogers (1971), J. Bruner (1968) and G. Kelly (1969), all in their own way developed new methods of scientific enquiry. In each case the "real scientists" were amazingly unimpressed, if not actively hostile.

In the area of applied science the use of the Scientific Method initially often seems to yield spectacular results. Innovations in atomic science, space research, medical practice, pharmaceutical research, town planning, transport, energy, management science, agriculture and biotechnology appeared to make rapid and ground-breaking progress. But each has suffered from more and more unexpected and sometimes disastrous side-effects. For instance, within biotechnology we are witnessing the emergence of a cult camouflaged as science but without an ethical foundation (McIntosh, 1998). Applied scientists have gradually been forced to recognise that they each need to re-think their methods of research, development and implementation, if they are to do more than temporarily exploit what were originally claimed to be new breakthroughs. Unhappily most of these apparent breakthroughs have turned out to be rather isolated gains that interacted with the larger system within which they operated to produce all sorts of unexpected (i.e. scientifically unpredicted) and socially disastrous consequences. It is these 'unexpected side-effects' that have made the general public more and more apprehensive about the activities of science, its moral responsibility and its sustainability in its current form (P. A. Payutto, 1995; Cupitt, 1992).

In developing their chosen forms of knowledge, pure and applied scientists often isolate their subject matter from its natural context. Health care is one obvious area in which this over-simplified approach has had scientifically unanticipated consequences. Energy is another and genetic engineering may well prove to be an irreversible third. This isolating of entities from their natural contexts has greatly simplified all manner of investigations, making many things possible (Medawar, 1969). Indeed it may well define the naive or what we call a 'stage 1' view of the scientific method. But this channel-visioned methodology coupled with scientists' over-eagerness to be first with the limited form of knowledge valued by their colleagues has over and over again proved costly when attempts are made to exploit this knowledge without adequate attention to all the contextual influences which then come into play. A more general systems-orientated approach is needed. This 'stage 2' form of the scientific method takes the gestalt, system properties of the phenomena into account by investigating it in its context. A system's properties arise out of the interaction of its parts moderated by its boundary conditions as these are conditioned by the larger systems that contain it. There is an increasingly impressive array of advocates for such 'system aware' methodologies.

One purpose of this paper is to suggest that if the term 'science' is to be applied across a wider range of studies, and we firmly believe that it should, then each of these areas of study needs to be re-construed, both in terms of how scientific knowledge in that area is recognised and defined, and in terms of how its particular forms of scientific method are made manifest and can be viewed one in relation to the other. These reconstruals of the nature of the scientific endeavour are requiring and producing methodologies that go far beyond stage 2, to an over-arching framework for a new 'stage 3' view. We call this conversational science.

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Researchers' attempt to observe and converse with different areas of our universe, world, habitat, community, field, hedgerow and electron microscope to reveal new data and different patterns of response [e.g. the Experimenter effect, Rosenthal (1966); the Hawthorne experiment; the Uncertainty principle, Heisenberg (1930); and the Gaia concept (Lovelock, 1979)]. These enable us to construct new meanings in these areas of investigation. As our shared meanings stabilise into accepted explanation, our conversational methods develop to probe and question the relevance and viability (validity, accuracy , reliability) of these meanings. The forms which human skill, imagination and cunning gave to the amazingly powerful, investigative conversations in the physical sciences were termed "scientific method". Each new area of study calls for, and eventually produces, new, more appropriate forms of investigative conversation (Goodall, 1997; Harré, 1991; Scott, 1993). When the rigour, power, generalisability and reproducibility of these conversations in a given area of study reach a level which is significantly greater than what has gone before (and shows solid evidence of continuing to grow), then we should include these new forms of conversation within our definition of scientific method.

Thus, for us, scientific method is any form of investigative conversation in its relevant domain, which enables human knowledge in that domain to grow systematically, in a testable and refutable form, by building on and continually expanding, replacing and renewing the relevant knowledge which has preceded it. The power of the stage 1 form of scientific method was that, by enabling a community of scientists to construct shared systems of meaning, it encouraged the systematic growth of knowledge in which one generation could stand on the shoulders of the previous one building from their pooled experience. The weaknesses of this approach stem from the belief that any one system of knowledge could be complete within itself.

The power of the stage 2 form of the scientific method is that it insists on the continuity and wholeness of nature and the need for knowledge to reflect this. It accepts the coherent totality of each person's experience. Thus, in pure science, physics throws light on chemistry and chemistry informs biology. More importantly in the practical living world each application of science must recognise the actual context of that application. Belated acknowledgement of side effects indicates the inadequacies in our methods for anticipating the consequences of human-provoked change. By definition, side effects lie beyond the focus of attention of the selectively purposive system of understanding which is being applied. The anticipation of side effects requires a more widespread use of systems-based, stage 2, forms of scientific method. Beyond this, the power of conversational science, our stage 3 form of the scientific method, lies in it's recognition that each manifestation of living matter has its own perspectives; each of which inevitably contains its own directionalities and its own set of self-defined values.

Any system of investigative conversations continues to warrant the term "scientific method" for just so long as the knowledge continues to grow by becoming more relevant, more viable and more comprehensive within it's own set of shared values. We would suggest that it ceases to deserve the name of science if the knowledge becomes less relevant, (i.e. we cannot see exactly why to apply it), less viable (i.e. we are unable to achieve what we set out to do, or we produce results which we do not intend) or it becomes less comprehensive (i.e. we require more and more special branches of science which demand more and more exceptions or special cases). It also ceases to be science if its proclaimed values become implicit and therefore un-negotiable; or if its activities become misaligned from its values.

In our opinion, much of what is today recognised by society as science suffers variously from all these defects. The shrill cry of many scientists to be better understood (and therefore better funded) would, if their research were to be implemented, reveal massive weaknesses in the authoritarian form and monolithic structure of traditional science itself.

Until a truly conversational form of scientific method is developed we can not construct systems of knowledge which serve more of the people, in more ways, for more of the time. We will only come to build participative, democratic forms of society when we believe that, whilst systems of knowledge do progressively reveal functional truths, their real power lies in offering tools for civilised, self-organised human growth and development. This treats systems of knowledge as powerful languages for enriching the lives of those who use them conversationally. Different purposes require different languages.

ON SCIENCE AND THE NATURE OF HUMAN LEARNING

Physical scientists aim their internal reflective conversation at inventing and discovering ways of provoking the physical world into offering them evidence about its nature. As physical scientists exchange their understandings about their 'conversations' with the physical world they come to agree certain meanings and more clearly recognise areas of unresolved mismatch. This mismatch leads them to re-asses their experiences. As part of this, they question whether the same terms mean the same thing to each of them. As they operationally define their terms and agree their language, they may still disagree about their findings. Then their attention becomes focused on the quality of the inner conversation through which they construct their meanings about the physical world. They define and refine their ways of theorising and their experimental methods. Gradually something called the scientific method emerges. This enabled physical scientists to converse one with another and agree criteria for deciding which of the many different meanings they constructed could be shared and agreed amongst them. From Aristotle to Popper (1972) and from Archimedes to Crick (1989) scientists have reflected upon and conversed about the nature of this conversational meaning constructing process.

Unhappily most of our educational processes have come to ignore and de-value this systematic, reflexive, conversational meaning constructing process. Instead the specific findings and methodologies of the sciences are taught by experts to novices and the less expert. In the short-term this may appear to be an efficient and economic way of achieving academic standards. But it is gradually becoming recognised that something essential is being lost. Some people argue that whilst reflective, discursive conversational education is good for the intellectual elite, instruction and training is more appropriate for the next generation of applied scientists. We see this approach as undermining our society. In the longer term, knowledge about our world has gone sadly astray. Theory, experiment and socially effective applications have parted company, to the extent that they cease to feedback effectively one into the other. The conversational process has broken down, to be replaced by the popularisation and exploitation of scientific knowledge (Payutto, 1995).

Why has one of the major achievements of mankind over the last five centuries become so unattractive? Students are turning away from the traditional sciences in droves. A partial

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explanation can be found in how students are expected to learn. The 'lessons' which science teaches, even the sacred scientific method itself, has become deeply misunderstood. The adventure of the reflective learning conversation which invents its meanings and its methods better to achieve its deeply questioned purposes has largely gone, except in the most trivial sense. The self-organised learning of science is replaced by the other-organised learning of derivative scientific knowledge. Even postgraduate students usually follow a prescriptive pathway, directed by scientific gurus. The primary processes of imagination and invention are lost in the pursuit of secondary transmitted knowledge.

Another effect of this misunderstanding of the "scientific method" can be seen, for example, in psychology where it took most of those investigating this "proper study of mankind" on a fifty year 'behaviourist' wild goose chase. Even now most of those studying cognitive psychology and 'consciousness' are still struggling to escape their education sufficiently to perceive the difference between the scientific method as conceived by the physical sciences and science as a human conversational investigative endeavour (Dennett, 1991). Self-organised learners are people who can converse with their environment in ways that enable them to construct and share meanings which will work effectively for them. Other-organised learners become stuck with the meanings which their education has sold them. They are blind to the full consequences of applying their knowledge in ways that produce results which that knowledge does not predict. This can be seen in the manufacturing and service industries, as in the development of new pharmaceutical products, cigarette manufacture, and agricultural chemicals. We can each think of our own examples of the unexpected consequences of applying scientific knowledge in un-scientific ways. For us the metaphor of the scientist as self-organised learner (SOLer) is a powerful concept. Such scientists construct their theories about the world as they act within it to progressively validate and expand their understanding, thus becoming increasingly viable and effective. S-O-L has relevance for scientific research and permeates beyond our current understanding of physical science, to psychology and social systems. It has consequences for the way we should support new generations to learn about existing knowledge whilst learning to conduct their own unique, personally relevant experiments.

We aim to illustrate this thesis by using the conversationally scientific results of some thirty-five years of our research into Human Learning. These results suggest how new forms of investigative conversation might sort out the relevant knowledge and set about building a new form of pedagogy (i.e. a theory of learning sustained by a symbiotic theory of learning support) which could enable more people in our society to recognise and use effective conversational science whenever it appears. Such a pedagogy would seek to produce personal conversational scientists, life-long learners, seekers after effective understanding: people prepared to construct their own meanings and then consider, evaluate and make selective use of other-generated knowledge. Individuals more fitted to function as members of our new, ecologically aware, more effectively democratic, Hi-Tech supported societies.

If this sounds far too grandiose, it is; or it would be if our proposed methodology did not admit a strong possibility of failure. In our opinion the current collapse of some eastern economies arises out of the application of stage 1 and stage 2 scientific method to social, cultural, political and economic problems which by definition require a stage 3 approach to the construction of shared meaning (i.e. knowledge). Such a methodology must contain its own self-regulating, self-revising , re-aligning. boot-strapping mechanisms: and the

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recognition that some "improbables" will always happen in the long run. Treated optimistically these are often the keys to creative reconstruction and even mind bending paradigm shifts. Gordon is a supreme example of just such an improbable; and as this edited collection of papers shows, he is so honoured.

One theme of the authors' own life-long learning project has been to study Human Learning in many of its 'natural' habitats. These have ranged from people-centred to low- and high-tech centred environments (Thomas & Harri-Augstein, 1985 and 1997). Studies that have ranged from junior schools to Olympic sports, from commercial and industrial training to learning in further and higher education, from learning highly complex skills in the armed forces to learning to control drug addiction in local communities, from transforming the learning culture in the Metropolitan Police to improving the counselling support in the Social Services, and in many other habitats. As our investigative attention focused on Human Learning as a subject in its own right, we were confronted with grave philosophical problems concerning the nature of science and the validity of the 'Scientific method' and 'Scientific truth' as we had come to know them. As our research progressed, it has become gradually clearer to us that the work of each scientist as a socially productive human endeavour can usefully be re-construed as a specialised form of life-long learning conversation; and that science can very usefully be seen as an effectively-communicating system of many such life-long-learning conversations. We have found that this reformulation of the scientific endeavour yields many insights about the human capacity to learn; and how this can be continuously transmuted as part of our evolutionary journey.

HI-TECH AND THE PEDAGOGIC DEFICIT

Our recent experience as members of a concerted action group for the EU DELTA Programme (Developing Advanced Learning Technology (ALT) - for the Design and Delivery of Learning Resources), briefed to advise on its Fourth Framework illustrates the need for a conversational, action research approach. Two thirds through its Third Framework, it was concluded that a 'Pedagogic Deficit' existed across all 40 projects and all scenarios i.e. Distance Learning, Open Learning, Self-Learning (one to one machine learning), Video-Conferencing and Virtual Classroom the World Wide Web and other forms of distance communication. ALT was driven by Hi-Tech designers largely for the commercial purposes of globally blinkered multi-national companies. It was marketed as highly innovative research. The pedagogic models that did exist were fragmentary, pragmatic or based on instructional parameters, failing to deliver life-long learning: rather creating a restricted environment for dependent other-organised learners.

Fundamental decisions had to be made which carry consequences for the design, function and delivery of a Hi-Tech Virtual Learning Environment. If the VIRTUAL movement is to be more than the delivery of mass education more cheaply, based on yesterday's values, if it is to be designed to deliver new qualities of learning more flexibly and productively to meet today's needs for innovation, participation and communication, then a new learning-supportive pedagogy is essential. This has to be structured, yet open and applicable in a broad spectrum of socio-economic-cultural contexts. For us, real life-long learning must be based on Self-Organised Learning principles.

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In the DELTA programme it was much easier, simplistically to exploit the new technologies than it was to systematically re-think and challenge the implicit assumptions about the nature of human learning upon which these projects were based. This led the group of advisors to discuss many of the crucial issues which confront society if it is to develop its educational activities. We discussed how to develop ALT (Advanced Learning Technology) in ways that support life-long learning; and in ways that would enable the forms of learning which will foster individual understanding, personal responsibility and group performance: so developing more truly democratic forms of society. Almost every TV documentary programme and multi-media training package seems, to us, to yield fresh evidence of how traditional methods of passing on the knowledge and experience from one generation to the next are failing to enhance the quality of individual lives or the ability of communities, countries and human society as a whole to produce the environments in which this is more likely to happen. In fact, quite the reverse. Un-imaginative instructional techniques seem continually to undermine the natural learning abilities of many in society.

The Pedagogic Deficit

This, it seems to us, is the essence of the "pedagogic deficit". It reveals a fundamental disorientation in the very nature of our theories and practise of teaching and learning.

Current methods of teaching often leave their clients too dependant upon instruction for them to become effective self-organised learners. When the teaching stops the learning stops. Even where there are courses in study skills, or in 'learning to learn' these are remedial and mostly aimed at increasing our readiness to submit to being taught. We are taught how to make better notes in lectures. How to get the "right" results in laboratory classes. How to ask the "right" questions. How to think laterally. How to prepare for exams. How to become more dependant on good instruction and how to measure our success in terms of the ways in which our learning is assessed by others: be they teachers, parents, employers, examination boards, professional bodies or what have you.

This was certainly true of the DELTA projects. All but one or two saw the educational job as one of selling a particular point of view (the right knowledge) to the users/learners. Even the two projects which treated education as social support for preserving and maintaining the local culture, saw this as an instructional exercise. The researcher/designers worked with the providers in what they thought of as action research to sell their cultural values to the users/learners through an instructional pedagogy. The High-Tech ALT was seen as a means for more effectively and economically achieving this aim.

The lessons from the DELTA programme were that

a) Designers and Providers were almost universally imbedded in an other-organised approach to learning. This was reflected in their implicit pedagogy.

b) Most Designers and Providers were unaware of having or needing a pedagogy. The nature of the teaching/resources required was to them so obvious (but implicit) that it was difficult for them to identify and reflect upon.

c) Even those who explicitly took a "learner-centred" approach were in practise often very paternalistic/maternalistic in their implicit pedagogy.

This last group (c) proved the most difficult to converse with because they felt that their sincere concern for the learners/users made them learner-centred. They believed that as their scientific do-gooding was well-intentioned their pedagogy must be user-oriented. The fact that users had ideas of their own was seen not as an opportunity to converse but as the poor user needing 'more education'.

THE HUMANISATION OF SCIENCE

Conversationally Scientific Findings: 25 Years of Action Research in Human Learning

Our first conversationally scientific discovery is that science is a human activity. This means that attempts to de-personalise either the process or the products of science will always be counter-productive if not down-right dangerous. Hence our attempt to report our research in first person terms. This does not prevent us from being rigorous, systematic researchers, cogniscent of the work of others. But it does prevent us from abdicating personal responsibility by hiding behind an unwarranted objective authority of established thinking or traditional practises. It also forces us to reconstrue the meaning of such terms as 'validity', 'reliability' and 'objectivity'. Validity, no longer as statistical, pre and post studies but as viability, i.e. as effectiveness of performance. Reliability, not as repeatability within a fixed scenario but as the appropriateness of ongoing performance in terms of the agents values and purposes. Objectivity, not as absolute truth but as shared subjectivity.

Our second conversationally scientific finding is that humans learn by conversing with their domains, they learn by observing, reflecting and acting, and then seeking to perceive the consequences of their actions. This is an open-ended multiple feedback cycle where the system cannot be explained from within itself (Godel, 1962).

Thus they construct open-ended meaning. This meaning enables them to anticipate the consequences of their actions. This takes the form of a selective perceptual set synchronised with their actions. If the meaning they construct is personally relevant and viable then their actions do lead to them perceiving the expected consequences of their actions. But what are the dangers? These are essentially two-fold.

Firstly, what they see as the consequences of their actions may be produced by other activities and processes in their domain. For most of us, for example, rain evoking rituals would fall into this category. To us this may appear obvious (Bellow, 1978). But in our own societies there are thousands of examples of where people, groups, communities and societies as a whole do things which they believe will produce certain outcomes. Then by taking a probabilistic approach they support their belief that sometimes what they do produces the result they expect. When it does not, they continue to believe in what is 'scientifically proven' by ascribing any hiccup to some unspecified interfering influences. A reflective approach and a systems orientation can combine in a stage 2 methodology to defend us from some of the more disastrous consequences (e.g. certain economic, medical, cyberspace, political and financial models) of these statistically based superstitions of traditional science.

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The second type of danger is that the meanings we construct may lead to more consequences than we perceive. Errors of the first type scientists would call superstition or prejudice. Errors of the second type scientists would call side-effects, secondary, delayed or unexpected consequences. In essence true science consists of learning to interact with the domain so that one's personal meanings become more precise and more comprehensive whilst we progressively reduce our errors of the first and second types.

Painstaking review of clinical trials have revealed many cases of where a stage 1 scientific method was used in circumstances which required at least a stage 2 if not a stage 3 approach. Because people are inevitably involved at some stage, all applications of scientific findings, by definition, require some form of stage 3 conversational methodology. People present a variety of perspectives, each containing its own set of values. People with different perspectives must use conversationally scientific investigatory techniques if we are to avoid consequences ranging from antibiotic resistant bacteria, global warming, the extinction of the tiger, inner city decay, to world-wide recession. No method at all would usually be preferable to the over confidence engendered by the excessive, often premature claims made for findings generated using an inadequate or inappropriate 'scientific method'.

The physical sciences have progressed amazingly far by deciding that errors of the first type should never be allowed to arise from assuming that the learning domain contains spirits, intentionalities or even conscious beings when other inanimate forms of meaning offer better relevance and viability to our purposes. But it is this very stance of science that makes it vulnerable when confronted with the need to explain animals including human beings. Religion offers alternative or complimentary meanings to those of science. But these also have their weaknesses.

In the biological and social sciences we set out to construct relevant and viable meanings about learning domains which may be constructing meanings about themselves and about us whilst we construct meanings about ourselves and them.

In Figure 1 we show two such meaning attributing entities in interaction. This is essentially a conversational situation. Our behaviour does not produce the consequences we perceive. We assume that another agent is at work. The agent is attributing meaning to our behaviour and

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Insert Figure 1. The meaning, action, perception cycle and the conversational situation

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themselves behaving accordingly. It is this construing of us whilst we are construing them that has made social science so apparently difficult when pursued through the scientific methods of the physical sciences. In accepting the physical science paradigm, the efforts of social scientists have been dissipated in trying to eliminate the independent agency from our subject matter. Whilst we "know" that as people we cannot do this, as scientists we have persisted because the scientific method (as defined by the physical sciences) seemed to depend upon our doing so (Skinner, 1971).

What we are proposing is a perceptual reversal of this problem. Let the figure become ground and the ground become figure. Let us re-construe science as a conversational activity. Let us assume that our subject matter is construing us unless or until Occam's razor allows us to demonstrate that we might as well assume it is not. Even when this is the case we can still continue to use the term conversation, since we are constructing meaning and behaving on the basis of that meaning: but we can restrict the nature of the conversation which we conduct to the patterns suggested by the 'scientific method' of the physical sciences. But now, we can construe this physical science activity as a special, restricted case of the more universal conversationally scientific method (Laszlo, 1996). Once we do this a number of insights emerge.

Our third conversationally scientific finding is that where people or even animals are the focus of our scientific activities then the subject matter of our theories, hypotheses and investigations will probably be construing us, the scientists, whilst we are construing them, the subjects of our science. We have no right to ignore or dismiss their ideas about themselves or about us as irrelevant to a public (scientific) understanding of the issues under investigation. This finding has led us to a reflexive approach. Communities of human scientists all relate one to the other along a continuum. It is useful to think of us all as acting as personal scientists (Kelly, 1969), with different, often inadequate ideas of what science is. By thinking in this way we realise that meaning, personal understanding, public knowledge and scientific knowledge are all created by people whose minds work in much the same way; i.e. conversationally (Edelman, 1989). Not by some cause and effect mechanism, not as the result of some stochastic probability system, not even by using fuzzy logic, but as the result of constructing our own meanings in the presence of others selective representations of their meanings.

This has wide-ranging consequences for the development of conversational science and action research as a systematic, comprehensive and potentially rigorous form of investigation. This is in stark contrast to many of the developers of ALT. Many of them make no attempt to anticipate the 'side effects' of their work. What it really means is that they obtain results in one over-simplified context and then claim or assume that their results will recur in totally different contexts. When this does not happen they explain away the difference in terms such as motivation, interest, etc. which they infer, rather than systematically investigate.

So our fourth conversationally scientific finding is that a fully-fledged action research process is the 'truly' scientific method for investigating individual, group and social learning. It is a collaborative process. It is, at best, fully conversational.

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ACTION RESEARCH AS A METHODOLOGY FOR CONVERSATIONAL RESEARCH

We have debated whether to continue to use the term action research and try to add rigour, precision and a more fully conversational flavour to its currently accepted meaning or to create a new term for our method. Elsewhere we have used the terms 'conversational methodology' and 'learning conversations'. But, for some readers, the first may be an empty phrase and in this paper, and many others, we have used Learning Conversations in a more restricted, well specified, technical sense.

We summarise our fourth finding:

(1) Action researchers and their clients are equal but different participants in the process of research. There are, therefore, always at least two sets of purposes and so at least two perspectives brought to the evaluation of the research.

  a) the clients pursue their own purposes in their own habitats

  b) the action researchers pursue their own research and purposes in the client's habitat: but they do this by enabling the client to better clarify and pursue their own purposes. Thus, by being of direct use to the client, the action researcher gains privileged access to the client's experience and behaviour in their own real situations. This provides the action researcher with relevant and significant evidence out of which to develop their 'conversationally scientific' understanding of such situations.

(2) The action researchers and their clients develop an ongoing, revisable Action Research Contract which clearly sets out

  a) the different purposes of those involved

  b) the perspectives and criteria which each will bring to the evaluation of the project

  c) the domain within which the action research applies, the relevant content of this domain, and the time span implied by the Action Research Contract

  d) the tools and methods which will be used and the purposes implicit in their usage.

  e) the need for an ongoing time structured, rolling series of revisions of the Action Research Contract.

(3) The process of action research is one of reflective learning, both by the client and by the action researchers. It is part of the action researcher's brief to provide the means by which the clients are enabled to reflect upon their own experience, i.e. to provide a mirror in which they can see their activities and a conversational framework within which they can become more aware of their ongoing thoughts, feelings and

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perceptions.

(4) This reflective process of learning means that the client will inevitably re-construe their purposes and that the Action Research Contract will need periodic revision in the light of what has been learned so far, and in the light of the ongoing development of the clients' purposes. The experience of clarifying and revising one's purposes is itself a significant conversational learning process.

(5) If action research is to remain a living human process, rather than become a robotish set of procedures, then the action researchers must also undertake to enter fully into their own reflective learning projects.

(6) If both client and action researcher have their own reflective learning projects as explicit components of the Action Research Contract, then their collaborative interaction will progressively become more fully conversational.

(7) For the action research project to become truly conversational, the process of action research itself will be an active, changing and developing component of the ongoing conversation. It also becomes self-referential.

In the DELTA Programme, the action research we proposed was more complex. There were at least five, rather than just two, perspectives. The sponsors providing the funds wanted to offer guide-lines to those receiving grants; but, in conversational science terms, as a stakeholder they needed to become participants in the action research itself. Whilst they did meet two or three times per year with some designers this was not a requirement of the programme: and in all the projects they appointed managers and monitors who played a rather ambiguous political cum financial role, rather than research methodology and philosophy role. This meant that the feedback to the sponsors was filtered through a series of value systems not fully congruent with the expressed purposes of the sponsoring organisation. It did not, in our opinion, form an adequate basis for systematic self-organised change.

The other types of stakeholder varied from project to project. Potentially there were three main groups. First, there were the designers of the Hi-Tech ALT systems. These always included people from at least two countries and always included both academic and commercial institutions. Second there were the providers of education, training or other opportunities for learning, e.g. Colleges and Universities, Industrial and Commercial Training organisations, community groups and providers of distance learning materials. Third were the users themselves, students, professionals on in-service training and groups of unemployed. What was needed was for each project to identify its own stakeholders from among sponsors, monitors, designers, providers and users. The group of stakeholders for each project could then have negotiated the Action Research Contract. Participant observation led us to conclude that there was a high correlation between the few projects that did this and the quality of the results achieved. The Hi-Tech designers often drove the project in a non-participative commercial way and the results were a perhaps superficially impressive system that failed to serve much useful educational, training or learning function.

TWO TYPES OF LEARNING AND TWO TYPES OF PEDAGOGY

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An action research, reflective model of the scientific method when applied to human activities takes us on to the next stage of our conversationally scientific findings. There are at least two parallel but distinctively different definitions of learning which co-exist in the literature and in the minds of people in our society (Thomas and Jahoda, 1964). The first (more natural?) definition relates to learning from experience in the absence of any intention by anybody to teach or instruct. The second definition relates to submitting to being taught or becoming the subject of instruction. In the first definition the learning is primarily appreciated and evaluated by the learners themselves. Others may comment that some change has taken place but the ultimate judge of whether you have learned from experience, is you.

In the second definition the primary judge of whether you have learnt anything is the teacher or instructor who knows what they were trying to teach you. You have learnt it if they can recognise it, and you haven't if they can't.

This difference between self-evaluation of learning and teacher-assessment of learning is crucial to our understanding of the issues involved in any appreciation of what life-long learning really means. It is crucial to understanding what we mean by science as the systematic construction of shared and well tested meaning by scientists who are life-long Self-Organised Learners. If we accept the second definition then life-long learning becomes a life of attending classes, courses or training sessions: of continually going back to school to be re-trained. It is no basis for science as we would like it to be. But it is the direct consequence of the ideas, indeed the whole philosophy, that underlies much of the current thinking in higher education. In this form of education, learning is basically a matter of the experts passing on their expertise to the novice or the less expert. There may appear to be discussion and debate, but in the end it is the experts who judge which students have successfully learned what the experts chose to teach. The Learning Conversation, is in this way, essentially skewed, since both the content and much of the process of learning are determined by another. We call this other-organised learning (Harri-Augstein & Thomas, 1991).

This was a major area of debate between Gordon and ourselves. The use of Petrie Nets, the identification of serialist and holist learners and even the methodology of Thought-Sticker were all, for us, still embedded in a pedagogic paradigm which was essentially expert-based. Whilst Gordon did negotiate with the learner, his purpose was to get them to learn what he wanted them to know. Their success was measured in his terms. In our terms self-organisation has three areas of freedom. To negotiate and define learning purposes, to develop learning strategies, and to determine learning outcomes and the ways to evaluate them.

Our first definition, in which the learning is self-evaluated and can happen in the absence of anybody's intention to teach or instruct, gives us a totally different perspective on life-long learning. When we apply this self-organised definition of learning to education, training and other forms of learning-driven change the whole situation is radically altered. Learning, life-long learning, is already happening to us anyway! So why should life-long learning be such a currently hot topic. The answer is both obvious and horrifying. It is that, by and large, our current educational methods, our implicit pedagogy is producing people who have become disabled from learning in a self-evaluated way. They are disabled from learning from experience. Thus our educational system is inadvertently making sure that if we need to go on learning life-long then we will repeatedly have to go back to school.

Fortunately our instructional pedagogies, implicit and explicit, are far from perfect so quite a few of us slip through the system. And despite the predominant instructional trends many individual teachers do still maintain their personal agendas and converse with the people they are teaching. So some of us come through the system less disabled than others. But even this analysis is not quite as simple as it might at first appear. Given our perspectives and personal pedagogies we may disagree quite profoundly among ourselves as to which of us is disabled, and if so in what ways. Again values and perspectives are central. So, a stage 3 scientific method is essential.

DESIGN PARAMETERS FOR A LEARNER-CENTRED PEDAGOGY

We have based this on an ACTION RESEARCH paradigm, taking into account three functional perspectives (see Table I).

Being client-centred, action research can allow for learner needs and initiatives and since researchers have privileged access to the unique experiences of their clients, the knowledge gained could provide a generic understanding of processes of learning and learning outcomes. Again, within such a paradigm all participants, be they Learners, Supporters/Providers or Designers are all action researchers, specifically conducting their own personal experiments, theory-building, developing models and revising these in the light of their results. But the three perspectives are not mutually exclusive. Providers learn by observing and supporting learners. Designers learn by observing how the Hi-Tech they produce is used by providers and learners. Action research mediates this through a conversational 'figure of eight' dynamic. Our new pedagogy suggests that we must treat the learner as a person. A person fully capable of conversation, of becoming a personal scientist and of becoming a Self-Organised Learner. We must also avoid any model (theory about) our learner which implicitly denies him or her any of the major attributes of a person. One reason why this is dangerous is because people, especially children, are good unconscious imitators who can unfortunately easily learn to act as if they were not fully functioning people. They learn to become what is expected of them or (as the other side of the same coin) they rebel and reject the learning opportunity, cutting themselves off from the resources from which they just might have constructed amazing new insights). Those who accept other-organisation of their learning and its unfortunately very real social fruits, can very easily over-learn this reduced role until it becomes second nature to them and they disable themselves not only in the training situation but also long into the future.

Thus are our sins visited upon us even unto the third and fourth generation. The most successful other-organised learners often move directly into jobs as teachers and academics, bypassing the opportunity to gain wider experience on the way. Their highly restricted first hand experience of other people's worlds can lead them to become over-convinced of the rightness of their own. It is this that makes some attempts by universities to 'measure' staff performance as 'teachers' or as 'researchers' so inappropriate. Our studies of how these

Close

Table I. Developing a pedagogic framework for action research conversations

Designers	**Providers / supporters**	**Learners**
Improve hi-tech design and facilities	Use pedagogic T/L models flexibly	Take responsibility for own learning
Innovate www/bulletin/ e-mail utilities	Provide learning resources	Develop process language for self-development
Program ALT learning tools	Create opportunities for learning	Operationalise strategic learning - personal learning contracts
Interactive learning domains	Provide process-based learning support	Personal needs/purposes
Learning games	Enrich learning domain	Specify purposes/strategies
High fidelity simulators	Offer feedback-for-learning	Elicit outcome criteria
Process-based help systems	Coordinate organisational learning	Review learning process
Multi-media /virtual reality	Elicit criteria for self-assessment	Refine referents for personal evaluation
S-O-L environments/ learning shells	Multi-perspective appraisal systems	Learning to learn skills
	Offer professional standards as referents	Bootstrap capacity for learning

Close

measures relate to effective learning or effective research (as we see them) and the development of relevant, significant, viable and socially useful knowledge, have yielded persistently negative results.

Our fifth conversationally scientific finding is that not only teaching but also learning itself is, or should become, an essentially conversational process. Primarily this is a reflective conversation with ourselves. But this reflective conversation fuels and is fuelled by the conversation which we generate with the domain within which we choose to learn. It is a collaborative conversation with those of our peers who share our interests and are choosing to learn in similar domains to ourselves. It is also a collaborative conversation with experts who are already in, or can be invited into our learning domain, at least vicariously, thus enriching our experiences.

In emphasising the conversational nature of learning we highlight the fact that learning is a process of constructing meaning. Effective learning is the process of constructing relevant and viable meaning. Relevant in the sense that it fits in with our purposes; and leads us to revise and expand our purposes as we learn. Viable in the sense that it enables us to do, as well as to understand. We will perform more effectively if we can construct viable meanings.

This process of personally constructing meaning enables learners to selectively evaluate and use their own experience as one central resource fuelling the process of construction. Where learning is seen as the reception of public knowledge and this reception is assessed by the provider of public knowledge. Personal experience is often dismissed as irrelevant, or at best anecdotal, and likely to interfere with getting the message right. Thus academic knowledge and other types of expert transmitted know-how can become progressively separated from personally validated knowing. This takes us back to the process of becoming a personal scientist and how different forms of education and training (i.e. pedagogy) may actively obstruct this.

So how do we design a system that treats the learner as a fully functioning person?

LEARNING AS THE CONSTRUCTION OF MEANING

For us, a pedagogy which enables learners to become self organised needs to address both the nature of Human Learning and the nature of the process which supports and enables the development of Self-Organised Learners.

The characteristics of a Self-Organised-Learner are elaborated elsewhere (Thomas and Harri-Augstein, 1985; 1993), and we have developed a compendium of procedures addressed by the Learning Conversation Methodology (Thomas and Harri-Augstein, 1991); Harri-Augstein and Webb, 1995).

Briefly, SOLers are sovereign learners. Figure 2 shows how they see learning.

SOLers proactively take responsibility for their own learning, identifying their needs and translating these into realistic context-relevant purposes. They know how to access a wide range of learning resources, purposefully, and strategically, initiating appropriate and
Figure 2. S-O-L

Close

SELF-ORGANISED LEARNING
THE DEFINITION

S-O-L is

THE CONSTRUCTION AND RE-CONSTRUCTION
OF

PERSONALLY SIGNIFICANT,
RELEVANT AND VIABLE

MEANING

WITH AWARENESS AND
SELF-CONTROLLED PURPOSIVENESS

AND

A PERSONAL SYSTEM OF MEANING
(THE SUM TOTAL OF OUR EXPERIENCE)
IS THE BASIS
OF ALL OUR PERCEPTIONS, ANTICIPATIONS AND ACTIONS

S-O-Lers ARE PERSONAL SCIENTISTS
AND ACTION RESEARCHERS
WHO REFLECTIVELY USE THEIR EXPERIENCE

Close

innovative tactics to meet the demands of the situation and of the tasks they are doing. They can generate their own criteria of evaluation from within the boundaries of their experiments and are open to consider the evaluative criteria of significant others. They can review their learning process as a whole and they demand creative opportunities for learning and see this as a life long process. The Learning Conversation technology supports learners in this endeavour.

Levels or types of meaning

But what type of meaning does the SOLer construct? At the first or primary level the meaning is a holistic, experiential remembering of what it is we are learning. We construct meaning from our experience. We test the quality of this meaning using self-evaluation criteria arising out of our purposes and the circumstances in which we are operating. If we are not good at this, our learning suffers. At this primary level a fully functioning multi-sensory memory is what we are aiming at. This has many advantages, the most important of which is to build a whole person experiential base against which to intuitively test any concepts, conclusions and explanations generated by our conscious mind. But as Luria (1973) has shown a photographic memory alone can be totally disabling.

Studies of children's learning (Piaget, 1954) illustrated what might be designated a second level of meaning. Instead of seeking a photographic memory we seek for internal coherence in our systems of meaning. By comparing and contrasting part with part we build up patterns, or systems of categorisation which enable us to see relationships and further explore inconsistencies. Logic, analogy, categorisation, de-construction, humour, metaphor story-telling, myth, are some of the terms which shed light on what we are doing at this level. We are sorting out our meanings in order to see them in relation to one another. This is one requirement of reflective learning and of science.

The third level of meaning which it is useful to consider directly relates to performance. We have designated this the explanatory or modelling level. Meanings at this level enable us to act on the outside world. We construct meanings which not only enable us to behave in certain ways but these same meanings lead us to expect certain consequences. The meanings we construct are anticipatory and they enable us better to achieve our purposes. Here are further seeds of science.

But the SOLer (and science) needs to do more. They can re-construct and elaborate their meanings thus continually revising, reforming and expanding their understanding and/or performance in the light of their ongoing experience; including, but not restricted to that offered by the teacher or the expert. Here is the essence of S-O-L. The SOLer accepts responsibility for this reconstruction and development activity. It does not happen to them. They make it happen.

At the fifth level the SOLer becomes creative. Creative meaning involves serious shifts in the whole nature of a meaning system. We have all experienced some of this. We call it having an insight or Ah-ha experience. In science Kuhn (1962) called it a paradigm shift. Creativity is the process of personal paradigm shifting.

Close

creative meaning
⇳
re-construct and elaborate meaning
⇳
explanatory or modelling meaning
⇳
internally coherent meaning
⇳
whole person experiential remembering

Representations of Meaning

Meanings are essentially non-conscious, even unknowable. They are a whole set of relationships that exist between the complete person and their habitat (environment) as they experience it. Our full meaning system is essentially unknowable at first hand. It is what Polyani (1966) called tacit knowing and what Rogers (1971) called trusting ourselves as fully functioning organisms. Jung (1972) and other psycho-analysts have also been deeply concerned to understand this phenomena. It is what most of us would call our experience or intuition, the old Adam or the beast within us. Poincaré as reported by Guiselin (1952) describes waking up with the answer to a mathematical problem which he had not solved when he went to sleep. But he then had to spend days consciously reflecting, to work out exactly how the answer could be derived step by step from his formulation of the problem.

We like to think of that part of us which creates and experiences consciousness as carrying on a conversation with the rest of our fully functioning organism, i.e. our experience; this deep inner resource which we can feel but which we cannot directly know at first hand. This inner conversation is essentially what constitutes learning (Edelman, 1989). It is here that meaning is constructed. This conversation changes and develops our experience but we can only sense these deeper changes through our conscious thoughts, feelings, perceptions and actions. In consciousness this conversation is experienced as representations of experience. Representations in visual, auditory, tactile, olfactory, verbal, symbolic and kinaesthetic terms, i.e. in all our sensory / motor activities. It is this conversational learning process which is disrupted and obstructed by the other-organised pedagogy. It is these obstructions which inhibits life-long learning.

So what is the pedagogy which can enable S-O-L?

THE SEVEN ATTRIBUTES OF A LEARNING CONVERSATION PEDAGOGY

What are the attributes of a Learning Conversation? This takes us to our sixth conversationally scientific finding.

The seven attributes of a learning conversation are:

(1) *Symmetry*:

- Content.
- Process.

- Asymmetry.

(2) *Psycho-rhythms*:

- Uncertainty.
- Exploratory.
- Provisionality.
- Disorder.
- Edge of chaos.
- Commitment.
- Directed.
- Certainty.
- Order.
- Complexity.

(3) *Three levels of conversation*:

- Life - needs/ relevance to person as a whole.
- Strategic - personal learning contracts.
- Learning to learn - personal learning skills.

(4) *Three types of dialogue*:

- Process awareness - PLC - PSOR - $MA(R)^4S$.
- Support during personal change.
- Referents for self-assessment of quality.

(5) *Ultimate reflective tool for personal modelling*:

- Modelling meaning at five levels.
- Modelling action as performance.
- Modelling this process as a whole.

(6) *Capable of internalisation*:

- Internal learning conversation enables quantum leap in learning quality.

(7) *Personal values*:

- Promotes self -organisation of values, personal myths and beliefs directed towards capacity for life-long learning.

Given an outline of an S-O-L theory of learning: what is the theory of learning support which will encourage and enable this form of learning to expand and grow? The primary requirement is that it is fully conversational. This means that not only is the inner meaning construction process conversational but the context in which it develops is also

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conversational.

The heuristic of a Learning Conversation allows for a precise and disciplined awareness of learning processes.

This Learner-Centred Pedagogy and its Technology (i.e. the Learning Conversation) addresses the development of personal meta-models of learning. This transformational capacity within the Learning Conversation enables learners to act as personal scientists and to observe their learning processes. It is this which enables them to review and develop their unique models of learning. A quantum shift in learning quality takes place. This generates an on-going capacity to learn. Internalising the Learning Conversation allows this to generalise into life-long learning.

S-O-L SYSTEMS SEVEN: A COMMUNITY OF ACTION RESEARCHERS

The community of 'action researchers' within the S-O-L System Seven practice seven types of Learning Conversation between five functional nodes (see Figure 3).

Some General Characteristics of S-O-L System Seven

1. Capable of application in any socio-economic-cultural-educational milieu
2. Focuses primarily on the learner and directly addresses processes of learning
3. Offers a flexible multi-modelling facility for varieties of learner-centred pedagogies
4. Offers seven conversational interfaces, each specifically designed to empower learners
5. Provides an action research environment:
   - learners develop their learning
   - providers/supporters develop pedagogic models
   - designers develop appropriate HI-TECH facilities
6. Can be wholly incorporated into computer driven machines as a Learning Support Generator
7. Can be People-Driven with a back up of HI-TECH Tools

As LEARNERS engage in their own action research within a SOL Systems Seven Environment in conversation with the LEARNING DOMAIN, The LEARNING TUTOR elevates their awareness of their experiences so that they can model their own process. The DOMAIN EXPERT creates Learning Opportunities thus enriching the domain. The Learning Tutor and the Domain Expert converse to expand the horizons of learning. The system functions as a network of conversations with multiple feedback loops so that the results of conversations give rise to further conversations. Thus, a SOL Systems Seven Community has its own intelligence and its own learning capacity (Capra, 1998). Failure to action effective Learning Conversations can induce pathologies of communication throughout the organisation (Scott, 1997).

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Insert Figure 3. The S-O-L System Seven

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The Learning Manager

The System is lead by the LEARNING MANAGER who holds several responsibilities:

- Operationalises the learning policy of the organisation.
- Guides the intentionalities in the ongoing system.
- Configures the learning/teaching pedagogic models.
- Provides learning resources; hi-tech/low-tech people.
- Builds in adequate multi-perspective measures of learning.
- Manages the whole system with a feedback for learning technology.
- Calibrates standards of self-assessment for learner performance; diagnoses performance criteria which require expert tutorial inputs.
- Supports the Learning Tutor in initiating individual personal learning contracts.
- Supports the domain expert in developing and customising the learning domain.
- Converses with the policy setters and specific departments/disciplines.
- Converses with the hi-tech designers.

The Learning Domain

In the computer the Learning Domain may be represented in words, graphics, audio, video, 3D, virtual reality, the internet etc; and it may offer interaction and behind the scenes processing that increase its power to simulate the reality about which it purports to help the learner to construct meaning. It may be designed to provoke meanings at the direct experience, coherence, explanatory, reconstructional or creative levels. Even if not designed to do so, its structure may still encourage one form of meaning at the expense of the others. At best it offers freedom to move between levels in a systematic and consciously articulated way.

Much more can be said about the nature of the simulated learning domain but the essential thing is that the user is able to construct meaning about the real learning domain whilst they use the simulation. If this is not the case, the experience they get is analogous to playing computer games. This is probably the greatest danger in using these forms of learning aid. The designers are usually so familiar with the real situation that their simulations can temporarily and very usefully serve as representations through which their reality may be negotiated. But for the learner with little or no experience to bring to bear, this is not necessarily the case. They build their meaning out of their computer, TV, film or reading experience; not out of direct experience of the real world. This can have catastrophic consequences.

The Learning Domain Expert

The task/content teaching functions of the Hi-Tech ALT derive from the interventions made by the Learning Domain Expert or what represents this within the system.

The interventions of the Learning Domain Expert can take two different forms:

(1) The expert may manipulate the Learning Domain itself to create new learning

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opportunities for the Learner. This may be no more than providing a reading list, thus expanding the limits of the Domain or it may involve manipulating the domain itself, e.g. vari-time in which time can be speeded up or slowed down to emphasis certain characteristics which are not so easily comprehended when viewed in real time or in the real situation. The BBC wildlife videos on TV offer one example of this. Except that most of us do not have the real life experience to construct truly useful meanings in this domain. The experience is like a computer game for most of us, it creates a fantasy world of its own which is not easily mapped back into the reality of our own experience. This only becomes obvious if one really goes on safari. Much reflective activity is required before the TV material can usefully be brought to bear on the reality of nature in the wild. For many learners going, say, into their first job, academic knowledge has just this same fantasy feel about it.

The Learning Domain Expert's manipulation of the learning domain to provide new learning experiences is limited only by the imagination and creativity of the designers/domain experts/teachers involved. But in practise many teachers and most designers of ALT systems pre-empt much of this exploratory activity by selecting, sequencing, simplifying and otherwise 'helpfully' artificialising what is available to the learner. This, wedded to an other-organised pedagogy, explains part of the deficit.

(2) The second way in which the Domain Expert can intervene is to provide a tutorial content-based filter between the learner and the learning domain. This may be not more than a series of questions used at certain stages in the learning The filter may offer a series of tasks to be carried out by the learners to "facilitate' their learning. Again the possibilities are only limited by the imagination of the expert.

The problem with both of these types of intervention is that what may be useful to one learner may rightly be felt as a hindrance or obstacle by another.

The designers filtering skill comes in making the expert interventions available to those who need them. But keeping the direct access available to those who would rather work that way. Similarly the manipulation of the domain becomes a much more powerful facility if control of it can be offered to the learner themselves when and if they feel able to use it effectively.

The Learning Practitioner as Learning Tutor

The Learning Practitioner can again be part of the Hi-Tech ALT resource or may be a person. Preferably people and computer should be used each to do what they do best. They should not be seen one as a substitute for the other. In essence the learning practitioners conduct an Ongoing Learning Conversation with the learners. They monitor the learner's conversation/ interaction with the learning domain. They then use their understanding of this interactive process to enable the learner to become aware of their own learning processes constructing a meta-model of their learning thus transforming the quality of their performance and their capacity for life-long learning.

Learning Policy - The Committee of Stakeholders

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Let us now place the Hi-tech ALT back into its context of education as an ongoing action research process. The stakeholders, funding bodies, designers, providers and users all participate in the action research. They form a learning policy committee who debate and agree the learning policy within which Systems Seven operates. That is they negotiate the Action Research Contract which informs the whole pedagogical process.

By creating a learning culture and by nurturing a network of conversations with freedom to learn (Rogers, 1969), and personal experimentation, (Kelly, 1969), Systems Seven enables a creative learning community (Senge, 1990).Within business and education designed, formal structures predominate at the expense of informal, open conversations stifling innovation and change. S-O-L Systems Seven offers opportunities for transforming business and educational worlds according to emergent principles (Maturana and Varela, 1980).

THE TAXONOMY OF ALT FOR THE S-O-L SYSTEM SEVEN PEDAGOGY

The ALT which supports the seven functions of S-O-L System Seven are seen as modellers of the functions within the community. Together these tools form a Taxonomy of ALT for SOL. The Learning Manager introduces these tools into Systems Seven to meet the needs of the community of learners. The MA(R)^{4}S heuristic applies to each of the seven systems within the learning community. It is through the process of MA(R)^{4}S-ing each system that the Learning Manager maintains the quality of the conversations that sustain the S-O-L support system (see Figure 4).

MA(R)4S-ing the seven types of Learning Conversation between the five functional nodes we have described introduces a meta-modelling facility throughout Systems Seven (see Figure 5).

The Modellers

We use the term 'modeller' as a short hand to designate the processes which encourage the construction of meaning as this in turn produces a personally relevant, significant and viable model of the learner's world.

The CSHL Software embodies these modellers in suites of computer programs (Thomas and Harri-Augstein, 1991; Thomas and Harri-Augstein, 1993; Thomas and Harri-Augstein, 1995).

Modellers I. Modellers Type I are used by the learner. The Structures of Meaning technology offers the user the freedom to sort and cluster their items of experience visually in many ways. Iterations of this process allow the user to add items, reflect on the implications of emerging patterns and revise and elaborate these as the personal meaning is negotiated.

The Repertory Grid technology enable a more systematic and intensive process of conversational reflection. The items of experience (i.e. elements) are compared and contrasted to reveal bi-polar constructs. The Focused grid can be displayed in many forms to reveal the patterns of meaning inherent in the ordering of elements on constructs. Interactive Trigrid offers these same facilities in a less mathematically driven form allowing the learner

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Insert Figure 4. The MA(R)^{4}S heuristic

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Insert Figure 5. A taxonomy of learning and pedagogy tools

Close

to converse and experiment with the re-ordering of their elements and constructs, giving priority to their construing rather than the city block cluster analysis . The REFLECT program talks the user systematically step by step back through these patterns of meaning. CHANGEGRID uses a series of grids elicited from the same person over a period of time to exhibit the process of change in understanding and attitude towards a topic. This is a powerful means of enabling reflective self-appraisal of personal change, i.e. of learning in the users own terms. PERCEIVE allows the user to explore the structure of their own perceptual processes and EVALUTE reveals the value judgements inherent in all construing. These programs all conduct powerful reflective conversations with the user.

The PAIRS program uses similar methods with two users, allowing them to explore how their personal construings of a shared topic map onto one another. This can be done using Structures of Meaning or Repertory Grid software. The EXCHANGE and CONVERSE programs take this interpersonal conversation further; allowing each to express their own experience in their own terms. They can then progressively map one onto the other, revealing areas of agreement and disagreement and areas of understanding and misunderstanding. Again these techniques go well beyond what most people can achieve with words alone.

The PEGASUS program combines all these individual and pair techniques into on-line multi-form conversations which reveal the inner conversations and/or articulate the inter-personal ones.

Other S-O-L learning software uses talkback through records of behaviour, such as video recordings and computer protocols. Sophisticated self-defined categorisations of components of behaviour, for analysis and reflection facilitate the re-construction and review of performance.

Modellers II. Modellers Type II are used by the Learning Practitioner or Tutor to enhance the power of the Learning Conversation.

The PLC program (Personal Learning Contract), which also encourages reflection, takes a different form. It is also content-free; eliciting the user's experience as the basis of the conversation. But it is more immediately purposive. It enables the user to explore their needs in relation to a specific task, situation or topic; and to express them as a well-defined learning purpose. It then enables them to examine their skills and to identify their resources to formulate a feasible learning strategy for achieving this purpose. Finally, in this first stage, it asks them how they will judge their success. That is to enumerate the expected learning outcomes, both within themselves, and in the form of performance or products; and to determine how they will evaluate these in terms of their purpose. The second stage of their PLC is their monitored attempt to carry it out. Modellers I are recruited to heighten awareness of how their actions relate to their meaning construction as part of a self debrief conversation. The Review stage takes them step by step through a comparison of how what they did matched or differed from what they had planned. Carefully carried through, this raises their awareness of how, exactly, they do learn. Used over a series of PLCs this technique leads to remarkable improvements in their capacity for learning.

Modellers III. Modellers Type III are used by the Learning Manager to provide participants with real-time information about how various aspects of Systems Seven are functioning. For

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example, the S-O-L Spreadsheet is used to track the S-O-L activities and performance of all the learners in organisational terms. The Personal Learning Biography is used to track the learning activities as recorded in the PLCs, their achievements expressed in their own terms as well as those of other interested stakeholders such as peers, teachers, managers and experts.

Modellers IV. Modellers Type IV are used by the Learning Manager and the Learning Organisation as a whole to help integrate the learning activities of Systems Seven within an evaluation framework. For example, the Feedback for Learnning package can be used by all participants in Systems Seven as well as evaluators from outside to elicit and negotiate the criteria which they are using as the basis for their shared judgements. The software can produce various kinds of data for the different stakeholders involved. Learners can have detailed information about the range of judgements being made, including their own, within each of the criteria being used. The Learning Manager and the Learning Practitioner and the Domain Expert can have a breakdown of their own judgemental processes, both in comparison to each other and in absolute terms. They can also get detailed comparative information about variation in standards among themselves on any criteria so the definitions of the criteria can be more clearly agreed and standards negotiated across the group. Finally assessors outside System Seven can get better information, more valid and reliable, more detailed and systematically organised, on which to base their assessments. If necessary criteria external to the System can be included, thus extending the range of referents towards public standards set by various professional bodies.

Modellers V. Modellers Type V can make explicit the processes of exchanging meanings within Learning Networks. These can be peer learners, teams of Learning Practitioners and Learning Managers as well as the Domain Experts and others within an organisation.. SOCIOGRIDS is designed precisely for this purpose.

The S-O-L Database

The seven conversations within the community of Systems Seven contribute to an evolving Learning Database which is intrinsic to it. This represents one conversational outcomes of the fully-functioning system. It is the cumulative experience of the organisation or community which is its major learning resource.

The reflexive nature of S-O-L System Seven generates a capability for modelling a whole organisation, allowing the organisation to develop its activities and reconstrue itself (see Figure 6).

DESIGNING A SYSTEM TO ENABLE LIFE LONG LEARNING

We have claimed that an S-O-L based pedagogy enables any learning entity, the learner, the pair, the group, the team or even the organisation to progressively become more able to organise their own learning. We have compared this process with the activities of scientists. Our seventh conversational scientific finding takes us beyond the first (science is a human activity) the second (humans converse with their domains) the third (the "subject matter" of

Insert Figure 6. Empowering the learning organisation: modelling the theory and practice of S-O-L

Close

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our investigations is construing us), the fourth (action research is the scientific method), the fifth (learning is a conversational process), the sixth (the S-O-L pedagogy is a system of Learning Conversations) towards the edge of our uncertainty.

We offered our views of how the idea of the scientific method is growing and developing to encompass the need for a humanly scientific approach to a wider range of problems. We have used the idea of a conversational science to illuminate what is for us a fatal flaw in society's approach to education: to the learning opportunities it offers to children, young people and adults. We have shown how S-O-L can provide a framework within which everybody can take more responsibility for the direction and quality of their own learning. We have sketched our S-O-L Systems Seven network of conversational learning support systems for individuals, pairs, teams and progressively larger organisations and communities. We have offered a taxonomy of tools which can be used to enhance the quality of these systems. Now, we need to show how the idea of conversational science might be given a formal structure. This structure is offered in the form of five postulates which we believe could eventually evolve to become universally recognised axioms. Perhaps our five postulates for conversational science are the beginning of a paradigm shift for science itself.

Five postulates for conversational science

Postulate 1 — The proper elements of enquiry in science are conversational entities engaged in conversation endeavours. Human beings are but one example of such entities.

Postulate 2 — Conversation is a process in which meaning is negotiated. Thoughts, feelings and perceptions about the negotiation of meaning cannot be negotiated within the explanatory systems of traditional science. Interactive construction of meaning offers new ways of construing how one conversational entity influences another.

Postulate 3 — The methods of conversational science express the knowing of it; and the knowing of conversational science is informed by it's methods: method and knowledge co-exist in a symbiotic relationship, only some of which is conscious.

Postulate 4 — Conversational science offers fresh insights into other forms of scientific enquiry. This is because the knowing and the methods of conversational science can enable other sciences (and paradigms) to re-negotiate their meanings with themselves and with one another.

Postulate 5 — Conversational science offers people the means for self-organising their own change; self-organised change is the most meaningful definition of freedom. Such freedom is the corner stone of a democratic (cooperatively conversational) society and an interconnected world.

Throughout this paper we have referred to a diverse group of intellectual giants who together sing a harmony of songs. From ethology, anthropology, psychology, biology, ecology,

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chemistry, physics, cybernetics, mathematics, philosophy, religion, architecture and economics their emergent stories inform us that the world can no longer be seen within a reductionist, computational and divided lens. From particle physics to Gaia and galaxies, from the uni-cellular amoeba to the chimpanzee and human mind there exists a fundamental interconnectedness.

We are part of a world of dissipative structures (Prigogine and Stengers, 1985), in an open system which maintains itself in a state far from equilibrium. The emergence of new forms of order with the potential for dynamic growth and evolution is now in process as we leap into a new paradigm. We see S-O-L as central to this process. This allows us as consciously growing entities to specify the directionality of structural changes within us and in our environment, and also to specify which perturations from within our increasingly complex world can trigger them (Maturana and Varela, 1980). It is Self-Organised-Learning which allows a living system to bring forth a new world.

In becoming skilled S-O-L scientists, we need to learn new values and ethics safeguarding ourselves and our planet (Lubchenco, 1997; Polkinghorne, 1996; Rogers, 1997). Science itself has to grow to become an extended science (Penrose and Langair, 1997) taking account of a new form of social contract. An emerging vision of science embodies interconnectedness (Capra, 1988; Lazlo, 1996), design and purpose (Davies, 1998) and creative, conversational learning (Senge, 1990; Zeldin, 1994). Hopefully, the conversational methodology enabling S-O-L which we advocate engenders one ripple within the perturations of scientific method. Thus would our lifetime's professional endeavours be justified! The 'Blind Watchmaker' is dead; the New Science and the Learning World has de-constructed him.

Thank you Gordon for what you provoked us to research. Now let us converse about these postulates. We won' t let you drown us in a sea of mathematical symbols! But you probably will! The science of freedom is eternal learning.

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