



Learning Participation

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Learning participation as systems practice

Ray Ison, Chris Blackmore and Rosalind Armson

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Contacts:

Dr Peter Taylor, Learning Participation Coordinator

Email: participation@eircom.net

Website: <http://www.ids.ac.uk/ids/particip/networks/learnparticip/>

Jas Vaghadia / Jethro Pettit

Participation Group, Institute of Development Studies,

University of Sussex, Brighton BN1 9RE, UK

Tel: +44 (0)1273 606261 Fax: +44 (0)1273 621202

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Ray Ison, Chris Blackmore & Rosalind Armson

Systems Discipline, Centre for Complexity and Change, The Open University, Walton Hall, Milton Keynes, MK7 6AA

ABSTRACT: We describe an evolving praxeology for Systems Practice for managing complexity built on 30 years of developing supported open learning opportunities in the area of Systems within the curriculum of The Open University (UK). We ground this description in two specific examples of how notions of participation are incorporated conceptually and practically into a learners programme of study by considering: (i) the postgraduate course 'Environmental Decision Making. A Systems Approach' (T860) and (ii) the undergraduate course 'Managing complexity. A systems approach' (T306).

Introduction

We start our paper by reflecting on some of the experiences that bring us to this point. Like many others we (RI and CB) were inspired by Robert Chamber's early work (see Chambers 1983). We have all experienced in some way the failure of paradigms based on attempts by one person or group to develop another (see Ison 1990; Ison and Ampt 1992). In two cases this was triggered by working outside of our own country, and in the other (RA), by moving outside the constraints of an original discipline (Mechanical Engineering) (see Armson and Ison 2001). In the last nine years at the Open University we have found ourselves sharing concerns for systems thinking and practice, for epistemological awareness, for the design of learning systems and for developing a praxeology for systems practice which is ethically grounded.

How does this connect with 'learning participation'? An answer to this question requires a number of historical and propositional links to be made.

The first is to the work of a pioneering group of educators at Hawkesbury (now University of Western Sydney, Australia) who over twenty years developed an innovative, student centred curriculum based around students taking responsibility for developing knowledge, values and skills in relation to 'systems agriculture, 'autonomy in learning' and 'effective communication' (see Bawden et al 1985).

The second is to a R&D programme which rejected the notion that agricultural extension and student learning was about the transfer of information or knowledge but which sought to ground learning and action in a resource we all possess – our emotions and capacity to 'dance' in conversation. This project has led to insights into how the emotion of enthusiasm (the word comes from *en theos*, meaning the 'god within') could be seen as theory, biological driving force (i.e. emotion) and methodology for doing R&D (Ison & Russell 2000).

The third has its origins in the evolving form of the University but particularly the ethos of the Open University (OU) and the Open Systems Group within it.

The fourth is the curriculum developments undertaken by us as members of the OU Systems Discipline over the last six years which contain specific examples of how 'participation' is incorporated conceptually and practically into a learners programme of study. These are: (i) the postgraduate course 'Environmental Decision Making. A Systems Approach' (T860) and (ii) the undergraduate course 'Managing complexity. A systems approach' (T306) (see Open University 1998; 2000).

The fifth, and final link we propose is through the issuing of an invitation. For us, the giving and receiving - or accepting - of an invitation is an important phenomenon because it creates an emotional context - it is different to a demand or a request. A genuine invitation can be accepted or refused without changing the emotional setting. If you feel cross that someone did not accept your invitation then it was not an invitation in the first place - it was a demand disguised as an invitation. How an invitation might be experienced as an invitation is a research question that interests us in the context of systems practice for collaborative (or participative) action for managing. Our specific invitation in this paper is for those participating in this workshop *to reflect on what it is that you do when you do what you do*.

By inviting you to reflect on what you do when you do what you do we are asking you to consider what you do in terms of a general model of practice.

In the remainder of this paper we introduce the OU and then the specific courses we have been concerned with. From these experiences a general model of practice is proposed which could provide both a theoretical and practical basis for 'learning for participation' i.e. a praxiology. We prefer to describe this as systems practice. We draw out some personal reflections and further questions for conversation in the final section reconnecting in the process with Hawkesbury and enthusiasm.

The Open University

The complexity of the Open University can often be daunting for those who have never experienced it. The OU has been described as the greatest innovation in UK higher education in the twentieth century. It has pioneered two significant new developments - open entry and supported open learning - and it has created a unique learning experience that combines high quality with low unit cost. Moreover, it has demonstrated that open learning is popular with adults. The OU is the UK's largest university. Over 220,000 adults studied OU courses and packs in 1999-2000, and since 1971 it has taught over two and a half million people of whom 371,000 have gained a qualification. Currently 22% of all UK part-time higher education students study with the OU.¹ The

¹ Under the 'New Labour' Government in the UK the OU has had to contend with a range of new institutional innovations that have, it can be argued, failed to adequately build on past OU successes. These include the University for Industry, now Learn Direct, the e-University and the NHS University. This results from a failure to identify institutional win-win arrangements between supported open learning and traditional HE providers (see Ison 1999).

commitment to openness, which in practice means no prior qualifications are required at undergraduate level, sets, in contrast to other institutions, a different emotional contract with students – it is an invitation, not a demand.

Four key elements are claimed to have underpinned the OU (UK)'s success in delivering an integrated system of supported open learning. These are: high quality, multi-media teaching materials; locally-based tutorial support; first class research and scholarship and highly professional logistics. Elsewhere I have traced the history of the OU's development through three phases (Ison 2000; 2002): (i) linear, one way, delivery; (ii) feedback systems; and (iii) self-organization and autonomous design. The first two phases have been realized, the third is a possibility.

The nature of student's learning at the OU is qualitatively different to that at other universities. Laurillard (1993) describes research that identifies five distinct ways in which university students describe what they mean by 'learning'. This research was replicated at many universities with the same result, except at the OU. OU students also see learning as a way of 'changing as a person' - something that students at other universities did not identify. OU students recognised that when you understand more about why things happen it changes the way you think about the world. One other important feature is that about 70% of our students are in employment during their study; the median age of our students is 32 and falling.

As a "learning system" responsibility for OU course and programme development and its associated assessment has been centrally designed and delivered to students. However, unlike other institutions, all courses are developed by a course team – a group of academics and support staff. One of the key practices at the OU is participation in a course team. This is very different from delivering a course as a lecturer responsible for one part of a curriculum. Historically the locus of innovation has been the course and students have had freedom to construct their own curriculum – they thus participate in the design of their programme of study. A course is also a significant investment ranging from £200k to the best part of £1 million.

Curriculum innovations in the Systems Discipline

The OU has been involved in 'applied' Systems teaching and research for 30 years - some 25,000 students have studied systems courses in that time (see Maiteny and Ison 2000 for an overview). The inspiration for Systems teaching came from the founding Dean of Technology who said:

"I felt that a concern for and systematic study of the social and environmental aspects of technology was essential. Certainly environmental problems were approachable only by means of systemic and interdisciplinary methods and I felt convinced that any Faculty of Technology that did not concern itself with such problems could not claim to be either modern or responsible, whether socially or academically".

Systems and Design were therefore seen as key process-disciplines that were to work in close collaboration with the more conventional and analytical subject-disciplines of technology (e.g. electronics, mechanical engineering, materials engineering). The aspiration was that Systems and Design 'would contextualise and synthesise the

subject-disciplines and act as catalysts for interdisciplinarity' (Holister, 1974). To a large extent this aspiration has been realised in one of two ways:

1. introducing systems thinking 'by stealth'. This has occurred through the contribution of Systems staff to the design and management of the Faculty's long-running Foundation, or level one course, 'Living with Technology' (OU code T102 and its predecessors T100 and T101) which 31800 students successfully studied from 1989 to 1999. Since its inception this course has situated technology in its social and systemic context. Presentation of this course ceased in 1999 but the strategy has been perpetuated in at least two of its replacement courses. For example in 2000, 12,000 students are studying the web-delivered course 'You, your computer and the net' (T171) which introduces some systems thinking concepts. A further 1200 students are studying T172, 'Working with our Environment: Technology for a Sustainable Future' which also introduces systems concepts.
2. developing and presenting overtly Systems courses since 1973 (Maiteny and Ison 2000). For example:
 - ◆ 10,795 students successfully completed the course 'Complexity Management and Change. A Systems Approach' (T301) from 1983 - 99; this course developed students' ability to practise three systems methods: the failures method, the hard systems method and soft systems methodology;
 - ◆ 1,006 students had claimed the Undergraduate Diploma in Systems Practice award a year after its introduction in 1998 (this is gained by completion of 120 points of study of specified Systems courses, one-third of the points required for an undergraduate honours degree);

The '*Environmental Decision Making. A systems approach*' course

This course had its origins in the desire by the Faculty of Technology to expand environmental post-graduate (PG) teaching in 1994 (see Blackmore and Morris, 2001). There was a desire to expand into a program based on two specific courses already developed as part of a MSc in Manufacturing Management. There was also at that time a willingness to innovate in course development e.g. course import rather than OU-based development. Initial priority was seen to be in area of EIA (environmental impact assessment) but after extensive investigation of what was available no courses were found to be suitable or to match our quality specifications. The one exception was a course on Environmental Ethics written by environmental philosophers at the University of Lancaster for Wye College. This was subsequently imported from Wye College (now Imperial College at Wye) as an elective in our program (T861 'Environmental Ethics'). However this course was not what we desired for the additional core course in a new set of Degrees in Environmental Decision Making (EDM) so we set about developing our own new course.² The course we developed was 'Environmental decision making. A systems approach' (T860) which has at its core the heuristic EDM framework depicted in Figure 1. Entry to the program is open to anyone with a first degree or, via the Advanced Diploma route, to those without a first degree.

² The other core course was 'Enterprise and the Environment' (T830, now T862).

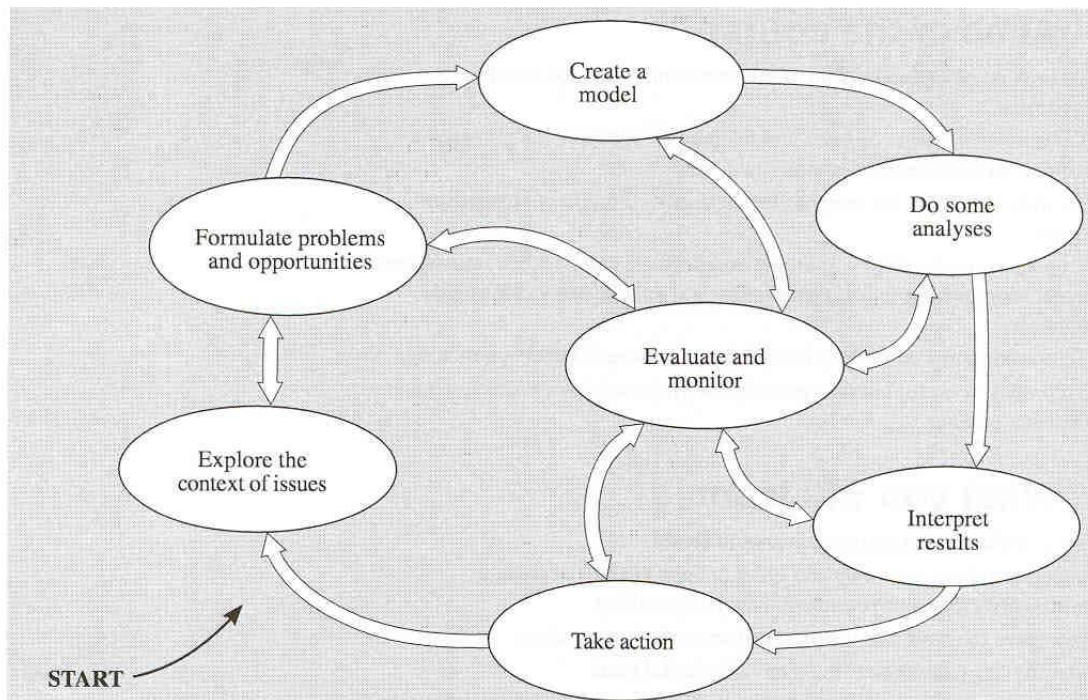


Figure 1. An environmental decision-making framework around which the OU course 'Environmental Decision Making: a systems approach' (T860) is conceptualised.

The process of development of the course was participatory in nature. We conducted meetings for a wide range of internal and external stakeholders from which a core course team coalesced responsible for the conceptual development and delivery of T860. Our EDM Programme was launched in late 1997. We had made a conscious decision to reject 'Environmental Management' in favour of EDM for the programme and course name because of (i) the historical commitment in our group to systems thinking and practice for the generic practice of 'managing'; (ii) our active pedagogy which contextualises all course material in the day-to-day lives of students; (iii) our desire to build students stakeholding in the process of environmental decision making through the course, and (iv) our concerns that many of the tools of environmental management such as EIA, social impact assessment, ISO14001 and EMAS were either not inherently systemic or were not being used systemically.

The course is organised as a series of six blocks of study based on Figure 1 (Blackmore and Morris 2001). Environmental decision making in T860 (and in the program) is considered as decision making that:

- has an effect on our environment:
 - in the context of economic, political, technological and social considerations;
 - in the context of sustainable development as a particular historical discourse;
 - in the realisation that all systems thinking is also environmental thinking;
- respects the capacity of ecosystems to support and sustain particular processes e.g. pollution
- enables individuals to consider their own behaviours and attempt to act responsibly;
- considers the ethical bases of our actions;
- appreciates that technology can have both positive and negative environmental effects.

The features of the EDM framework particularly relevant to 'learning participation' are (Figure 1):

1. The model starts by engaging with EDM by exploring the context of environmental issues. In the first block an historical case study of the Twyford Down extension to the M3 motorway in the UK is presented. The introductory material in Blocks 1 and 2 then invites students to:

- recognise that issues arise through social processes which have a history;
- recognise that it makes sense to appreciate issues in context, to stand back and avoid traps such as disciplinary thinking;
- locate themselves as stakeholder in the EDM situation;
- recognise sensitivity to initial starting conditions – i.e. that starting off systemically (or holistically) creates different trajectories of decision making (this material also addresses what it means to start off participatively as such a process introduces multiple partial perspectives).

In Block 5 entitled 'Evaluation, Monitoring and Taking Action the course deals with

- types of environmental action; backcasting and design.
- institutional platforms for action
- systemic and systematic design of evaluation and monitoring
- evaluation; formal and non-formal approaches - EMAS, ISO14001, EIA, participatory processes.

The course has a number of audio and video resources to support it including a video entitled 'Participating in Environmental Decision Making' which is now in version two³. Since first presentation in November 1997, 892 students have studied T860 with 823 students studying the other core course in the EDM program (T862).

Assessment

Students in the course have to complete three Tutor-Marked Assignments (TMAs) and a Project Report.

Students are advised that their 'project will involve an exploration and analysis of an environmental decision-making situation using the framework presented in the course [Figure 1]. The development of your project begins in TMA01, continues through the other two TMAs and culminates in the project report. Introducing the project early in the course is intended to help you get the project work under way so that when you come to write up your report, much of the work has been done already. Your tutor will give you feedback on your project plans through the marks and comments on your TMAs.You will need to approach your project critically, systemically and systematically using a range of course concepts and techniques. The way in which you carry out your project will be as important as what you find out. You will need to focus your investigation and explain in your project report not only what you did but how you did it and why. You may also need to explain what you have not done and why.' (Open University 2002) The criteria for project choice are:

- it must be an environmental decision-making situation
- the student must be a stakeholder in the situation
- it must be of an appropriate scale and scope to enable the student to meet the marking requirements

(see Annex 1). The marking scheme for the project is shown as Annex 1.

The 'Managing complexity. A systems approach' course

³ Materials from both courses will be available for viewing at the workshop.

This 60 point third level course, first presented in 2000, applies systems thinking to areas such as information systems, organizational change and learning, managing sustainable development and professional practice. The course develops skills to think differently and creatively about issues of perceived complexity, and enables students to appreciate and manage these issues in ways that lead to improvement. The content of the course is practical, but includes tools for re-conceptualising. At the core of the course is the metaphor of the systems practitioner as juggler. The four balls that are being juggled in the practitioners performance are: the processes of BEING a systems practitioner: the B ball; the situation I am ENGAGING with: the E-ball; CONTEXTUALISING the approach I am taking : the C ball and MANAGING in the situation: the M ball. The four balls, BECM are also related to student's enactment of the action-learning cycle to intervene usefully in the world (following Kolb 1986). The course is deliberately ambitious. It makes some radical departures from previous OU teaching of Systems: (i) it breaks away from seeing systems thinking and practice as just a rational pursuit. A case study of organizational and information system failure – the UK Child Support Agency – is used at the start of the course because it addresses an issue in which everyone is able to take a stake – child support and parenting – and because it triggers the full range of human responsiveness including the emotional; (ii) we take epistemological responsibility for what we as authors write, thus modelling the epistemological awareness we seek students to gain; (iii) we focus on developing systems practice as a 'performance' adapted to a context for the generic process of managing i.e. it is not a specialist role or the preserve of consultants and (iv) we position 'methodology' as something that cannot be simply written as words on paper but only experienced as the braiding of theory and practice in context; and (v) assessment is based on a project as well as an examination set so as to enable reflection on practice, including the practice of diagramming which is central to the OU pedagogic approach.

One of the ambitions of T306 is to enable students to grow in their epistemic awareness and to thus enhance the repertoire of choices they and others have in given contexts. This is an ethical imperative that from our perspective is central to any notions of 'learning for participation'. Heinz von Foerster expressed the practical choice we can make in these terms (1992):

"Am I apart from the universe? That is, whenever I look am I looking through a peephole upon an unfolding universe?"

OR

'Am I part of the universe? That is, whenever I act, am I changing myself and the universe as well?'

The second position offers the ethical basis for participation. So in this course 'learning participation' is manifest in two ways: through recognition that the student as systems practitioner is never outside of any system of interest – there is ultimately no external objective position – we are all participants in the worlds we bring forth. The second is through a specific focus in Block 4 entitled 'Managing sustainable development: learning with other stakeholders'. The block takes a learning system approach and adapts mode 2 SSM (Checkland 1999) for use in multiple stakeholder settings. This involves students in not only learning, but designing learning systems for stakeholders. That is, we move from single to double loop-learning and the notion of design.

I would like to expand more than I am able on whether we succeed or not in our pedagogical ambitions. We have some data and know the course is highly rated by those who complete it. We also know that it is very

demanding. However we recognised from the start that learners would opt to take different pathways through the course and we wanted to ensure that the ‘instrumental learner’ was still able to pass. But it requires more than an instrumental engagement with the course to do well. There are also questions about the learning support our students get and the adequacy of both challenge and support needed to chart difficult epistemological waters.

Reflections and further questions

The design of ‘learning systems’ for systems practice

In Table 2 we outline nine design considerations which come from reflections on our thirty years of evolving pedagogy. We invite workshop participants to consider whether these are essential or desirable design features for a curriculum for ‘learning as participation’.

Table 2. Nine design features of Systems courses at the Open University
1. Ground concepts and action as much as possible in stakeholders’ own experiences;
2. Learn from case studies of failure;
3. Make assessment relevant to action in the personal and professional lives of students.
4. Develop diagramming (and other modelling) skills as a means to engage with and learn about perceived complexity;
5. Take responsibility as researchers and authors for what we say and do (epistemological awareness);
6. Recognise that learning involves an interplay between our emotional and rational selves;
7. Develop skills in iterating - seeing learning as arising from processes that are not deterministic;
8. Introduce other systems concepts, tools, methods, and methodological approaches so as to develop skills in <i>‘formulating systems of interest....for purposeful action’</i> ;
9. Move attention to verbs not nouns! (i.e. verbs denote relationships and activity and are key to the process of activity modelling which is one of the main features of SSM (soft systems methodology).

A particular challenge for some students, particularly with a science or engineering background is the request to forget the standard advice for writing project reports that they have encountered. In most contexts students are told that they should be written in a formal style avoiding the use of ‘I’, ‘my’ and ‘me’. For the T860 and T306 project reports, a more personal style is appropriate – using I is one way of taking epistemological responsibility. For example, in T860 the sections describing student’s own role as a stakeholder and their critical analysis of the framework will be a personal account and inevitably need to be written in the first person. In T860 as well as discussing a range of things about participation we do take a position (i.e starting out systemically is desirable) and students do have some different experiences of our position which they discuss in their assignments and projects and on the course conference. Sometimes they challenge us (woolly academics) on grounds of the time it can take and the practicalities they face...so we continue to learn about it ourselves.

Some implications for ‘learning participation’ as systems practice

The verb ‘participate’ has several roots. These are to ‘take, grasp, hold’; to ‘have a share’ to ‘make ready’ (Shipley 1984; Barnhart 2001). Shipley (1984) refers to: ‘Coming beyond, or before, one may dally, or prepare for others help or harm’ to exemplify the sense of ‘making ready’. Elsewhere Ison (2002b) refers to the relationship between responsibility and response-ability as a duality that in the flux of daily life can be seen as having an underlying pattern of emotions and ethical embodiment. For example when one feels included (invited) the emotion and action changes – one feels response-able. At the same time as engagement occurs

those who are participating begin to take responsibility – they learn and see ways forward. To an observer these people might seem to be taking leadership. A practical example which makes these notions more concrete is given in Armson et al (2001) describing a staff induction process run as a rapid institutional appraisal.

One of the long-standing challenges for ‘participation’ has been to deal with those who critique its naive populism and lack of theoretical and practical rigour. Sometimes this critique is well-placed but often it misses the point. As Russell and Ison (2004) note ‘numerous models of participatory research were available at the time we commenced our research project [see Ison & Russell 2000]. Each offered solid pragmatic reasons for their adoption over the more traditional ‘expert’ model where the scientific researcher worked in the laboratory, or its equivalent, and then promoted the benefits to the end-users. What was invariably absent from the ‘how to’ models was any sense of explanation, explanation, as a scientist would understand the term, as to how participatory research worked.’ They found inspiration from Maturana’s work which offered a conceptual framework derived from the biology of living systems and the biology of cognition. Specifically it offered a conversational model of research in which the researchers and the anticipated beneficiaries were inventing a researching ‘space’ together.

This suggests some questions for the workshop:

- (i) What enables in formal and non-formal settings a group of learners to engage in the flux of being response-able and being responsible (this is the B-ball of the systems practitioner)?
- (ii) What might we experience when we claimed we had experienced a ‘researching space’?

At the core of our invitation issued at the beginning of the paper to reflect on what you do when you do what you do is an invitation to explicate your understanding of the theory/practice dialectic (Figure 2). Theory and practice all too often are considered as a dualism- an either or rather than a duality, which means being related to constitute a whole. Consider the following perspectives:

- Kurt Lewin, sometimes called the initiator of action research, claims: *There is nothing as practical as a good theory.*
- Klaus Krippendorf, Geoffrey Bateson Chair of Communication at the Annenberg School in Pennsylvania suggests: *Human agency has been lost by centuries of oppressive theorising.*
- Whereas the economist Maynard Keynes remarked that when he talked to businessmen who claimed to be practical people uncontaminated by theory, they always turned out to be the prisoners of some defunct theorist of 30 years ago.

So what do you think? Where do you stand? We have found each of the claims to have validity based on our experiences. For us a Gary Larson cartoon showing two men on a deserted island with nothing in sight acts as a metaphor for both the possibilities and constraints of theory. The caption says: Bob! Wake up Bob! A ship. I think I see a ship.....where are your glasses? Bob’s glasses are on the sand with a boat painted on each lens. The cartoon evokes in a metaphorical way the notion of theories as models, or boats on glasses, through which we see or experience the world. As Einstein said to Heisenberg ‘It is the theory that determines what you can observe.’



- *'theory and practice'*
 - the move from nouns to verbs - to practising

Figure 2. Theory and practice can be seen as recursive or as practises (verbs) that are recursively embodied by someone, and which in the moment may not be distinguishable.

One way of breaking out of the trap of thinking about theory as distinct from practice is to depict them in recursive relationship. This is better than maintaining an unhelpful dualism but remember that theory does not exist in a vacuum. It is always someone who theorises and practices, so it is helpful to turn away from nouns (a particular constraint in the English language) to the verbs associated with what is being done i.e. it is always someone who theorises and practises (Figure 2). As Krippendorf (1998) observes, the recognition that languaging is a dialogical process permits us to recognise that theories mediate between their stakeholders and reside in processes of communication. 'Theories cannot be found in the contents of statements nor inside individual minds but in the processes of their continuous re-articulations. Theories that fail to compel people to reproduce and circulate them within their community simply fade away'. The flux of theorising and practising goes on whether we are aware of it or not, but it makes sense to try to be aware of what we do when we do what we do.

A praxeology is that branch of knowledge that deals with practical activity and human conduct, the science of efficient action (SOED 1991). It is the lack of an effective praxeology that critics of participation often implicitly point to. The important point often lost by both critics and supporters alike is that it is not theory without practice or practice without theory but the reflexive emergence of both in a situated context. Our experiences at the OU show that it is possible to design and deliver courses, even ones delivered at a distance, which enhance student's capacities to act ethically and effectively.

The institutional setting

We have been invited to demonstrate the role of universities or higher education institutions in the facilitation of learning of participation. We cannot do this justice in the space remaining. Elsewhere the failure of policy

makers in Higher Education to respond systemically to the changing environment has been pointed out (see Ison 1999 and papers therein). It is also worth observing that the innovative, student centred curriculum developed about 20 years ago at Hawkesbury has for all intents and purposes ceased to exist. The reasons for this are multi-faceted, but we suggest they are the same set of factors that militate against creating the 'learning spaces' that are likely to be required for 'learning participation'. There is much that could be learned from studying what did, and did not happen at Hawkesbury over a twenty year period. There are also opportunities presenting themselves with expanding use of the Net in conjunction with the ethical entailments of the open source movement (see Ison 2002b).

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ANNEX 1. Assessment/Marking Scheme for the T860 Project Report

What you are required to do

Prepare a concise report on

1 An investigation and analysis of your chosen environmental decision-making situation using the T860 framework

(60% of marks)

Use the T860 environmental decision-making framework (shown in Figure 1) and work through its stages in relation to the situation you have selected for your project. This will involve:

- A detailed investigation of the situation considering multiple perspectives, including your own.
- Analysis of the situation using concepts and techniques you have learnt in this course, including diagramming.

2 Critical analysis of the T860 framework

(20% of marks)

- Make a critical analysis of the T860 environmental decision-making framework in relation to your own use of it.
- Explain how and why each stage of the framework was, or was not, useful to you in the investigation and analysis of your situation.

(10 % of marks will be awarded for the overall summary and conclusions of the report and 10 % for structure and presentation.)

Notes

- 1 You should already have done a substantial amount of preparation for your project through TMAs 01 to 03. Be sure to build on the work you have done. There will not always be time to wait for the return of marked TMAs before continuing with your project work so do keep going and, if necessary, contact your tutor for guidance. Figure 1 shows the relationship between the different elements of course assessment.

Figure 1 T860 assessment: the TMAs and the project

- Your report will be a summary account of what you have done. It will not be appropriate to submit everything you have worked through.
- 2 Make use of a range of information sources: (i) the T860 block texts, (ii) other relevant texts, (iii) material about your chosen situation (such as reports in newspapers, magazines, professional and academic journals, and on television, radio and the Internet), (iv) interviews or conversations with other interested parties if these can be arranged.
 - 3 As well as explicitly stating your role as a stakeholder in the situation and describing your own perspective, you should also give details of other stakeholders and describe their varying roles and perspectives. As you reach the end of your project work and are writing the report, you might also describe how your perspective has altered since you started. Has your stakeholder role changed?
 - 4 Think about each stage of the framework in turn. Is it relevant to your situation? If not, why not? Make notes about each stage of the framework, indicating both your thinking and your conclusion. For an idea of how to do this, look at Block 6 which demonstrates how the stages of

the framework and the concepts introduced in the course can be used to analyse a decision-making situation. Sections 5, 6 and 7 of Block 6 go through the stages of the framework with reference to the case study on genetically-modified organisms presented in Section 2.

- 5 Depending on your chosen situation and the time available, you may wish to consider a second or even third iteration of the framework. For example, a past decision could be analysed using the framework but, if the outcome was unsatisfactory, it may be more interesting to consider another pass round the stages of the framework in order to illustrate how the decision process might have been improved. This approach assumes the framework is used as a sequential process with each stage considered in turn. You might also use the framework as a checklist of concepts, to ensure all aspects of the situation are considered in your analysis. Both approaches are demonstrated in Block 6.

- 6 You are expected to use diagrams (which may be hand drawn). You should include some comment on their usefulness to your investigation.

You might also wish to use or refer to other modelling techniques where these are appropriate to your project. If you have the skills, and access to the necessary data, you could, for example, create an appropriate mathematical or other model of your own. Alternatively, if available, you can draw on information from models generated by others, as long as you acknowledge the source. The important point is to use models appropriately and to show that you have considered the strengths and limitations of any you include.

- 7 For the critical analysis of the framework, you need to describe the way in which you used the framework in your investigation and analysis and your thoughts on the process of using it. In other words, for this part of the report, you should not describe what you did, but explain how and why you did it. Making notes as you work through the stages will help you prepare for this. You should consider the following questions:

- Did going through the stages of the framework help or hinder your investigation and analysis of the situation you selected?
- Did it constrain your investigation or encourage you to consider aspects you had not previously considered?
- Did the framework help to enhance your understanding of your decision-making situation or did your understanding develop through other means?
- What factors determined the extent to which you used each stage of the framework? For example, were you able to find appropriate data?
- What, in your opinion, are the strengths and weaknesses of the framework?