

Lessons from nature: Developing an adaptive management model for sustaining quality learning environments

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If there is to be change in the way learning environments are perceived and managed, we need to shift the boundaries on the thinking genre for educational management. We need to explore the opportunities for alternative educational management models. Experiences from natural resource management are used to both define the learning environment, and to develop appropriate methods for managing the quality of education. An Adaptive Management Model is introduced to guide decision making in the learning environment. Educators at all levels, from the classroom to a national level, can use the model. The four-step model involves benchmarking using indicators to assess the current state of the learning environment; application of a management strategy to inform decisions; action to invoke changes to the learning environment and monitoring to assess the action's effectiveness. One may not be able to actively control the external factors influencing the learning environment, but must at least learn to manage for them. A case study is outlined to demonstrate the potential use of the model in developing an online learning strategy for Charles Sturt University. The roles and responsibilities of educators and educational managers in sustaining quality learning environments are discussed and future directions for the model suggested.

Introduction

Education is the way knowledge, ideas and skills are passed on from generation to generation. It is a fundamental part of our survival. The learning environment, from the home to institutions, is the habitat that supports education. Today, education is often seen as a commodity to be bought and sold, not the fundamental component of society it really is (Riley, 1997). Those with more money may have access to (arguably) better educational facilities (Berge, 2003). Administrators can be forced to make decisions based on financial concerns, without being able to consider the long-term effects on the people concerned. This has an alarming similarity to our natural environment. While we are dependent on our environment for survival, Australia clears more native vegetation than any other developed country (Neal, 2003) and Australians have been instrumental in the extinction of numerous plant and animal species. Natural resource managers have developed a range of techniques and tools to

respond to ecological disasters and environmental changes (Integrated Catchment Management Plan, 2003). Can we take some lessons from nature and natural resource management? Learning environments, from school to universities and the workplace, need to be managed carefully if they are to survive and support the need for quality education for future generations.

If there is to be change in the way learning environments are perceived and managed, we need to shift the boundaries on the thinking genre for educational management (de Bono, 1990). We need to explore the opportunities for alternative management models in the educational environment. The learning environment is described here and an Adaptive Management Model introduced for use as a tool in the planning and design of quality learning environments at a range of levels from the micro- level of the classroom to institutional, state or even national level. We draw on the experience of sustainable tourism and natural resource management to both define the educational environment, and to develop appropriate methods for managing the quality of the learning environment. Models provide an overall picture of how a system functions and guidelines for decision making and action. The concepts introduced in this paper are not new *per se*, but the introduction of adaptive management practices to the educational environment is believed to be new. The model has not yet been empirically tested, but examples of how it could be implemented in different situations are given. Finally, a view for the future use of the model in managing our learning environment is given.

Defining the educational environment

The word 'sustainable' looks past today and suggests planning for the future. It is appropriate, and hopefully not too late, that the theme of this conference looks at sustaining quality learning environments. It is positive that it is assumed we already have quality learning environments, with a primary objective to look at ways to both sustain and, one would hope, improve these for future generations.

To begin the transition from natural resource management, to educational management the learning environment must be defined. The environment is defined as the external conditions or surroundings. In nature the external conditions include the weather conditions and the physical environment. This poses a problem for the theme of this conference. How does one sustain external conditions that in effect *are* the learning environment? In nature this would equate to asking one to sustain, or control, the rainfall or sunlight. One cannot sustain or control external factors on a large scale, but by adopting the Adaptive Management Model one *can* plan to manage their impact on the immediate environment. The essence of adaptive management is to define and model the components of the system that one seeks to understand and control or influence directly. External environmental components are managed rather than controlled.

Figure 1 models the learning environment on which this paper is based. The learning environment components are the students, teaching staff and administration and their interactions with one another. It is these components and interactions we are seeking to understand and control or influence directly. Impacting on this environment are the external environmental components; economics, social, physical and political, which need to be managed.

A sustainable learning environment is defined here as; *a learning environment that is capable of being maintained at a steady level without exhausting or adversely affecting its human components or on-site material resources.* Natural resources in the

learning environment are described here as; *the living and non-living components of the learning environment that supply and support the educational needs of students and staff.*

Applying adaptive management techniques to the learning environment

Adaptive management techniques are commonly used in environmental and natural resource management (Buchan, 2002; Wentworth group, 2003; Rogers and O’Keeffe, in press). Adaptive management essentially involves four steps: benchmarking, strategy selection, action and finally monitoring.

Using adaptive management techniques we have developed the Adaptive Management Model (Figure 2), which can be used to manage learning environments. This model outlines a four-step process:

1. benchmarking to assess the state of the learning environment;
2. application of a management strategy to inform decisions;
3. action to invoke changes to the learning environment; and
4. monitoring to assess the effectiveness of the action on achieving the desired outcomes and to inform future action.

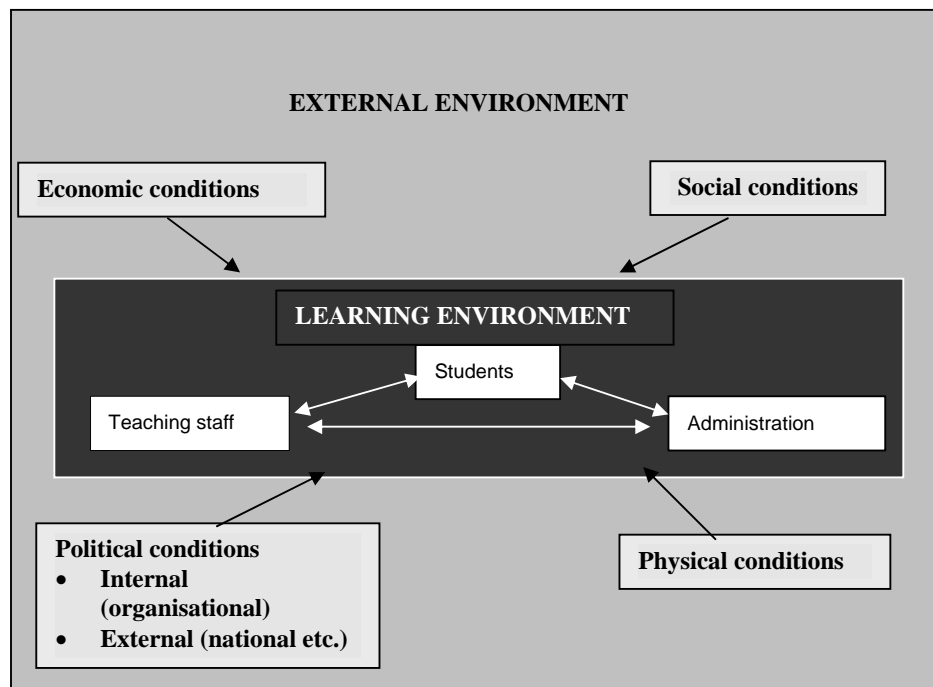


Figure 1 Model of the learning environment

Components of this model will now be explained and its application to specific learning environments suggested.

Step 1 - Benchmarking

Benchmarking involves three phases:

1. determining the indicators
2. measuring the indicators using appropriate methods of measurement
3. assessing the current state of the environment - changes in a single indicator may signal the need for action, but a composite measure and the use of multiple indicators are recommended.

In tourism and in education indicators measure information which assist decision-makers to reduce the chance of unknowingly take poor decisions (World Tourism Organisation, 1996). Some educational institutions already use indicators to guide their strategic planning (Charles Sturt University Strategic Plan, 2002).

An **Indicator** reflects a certain condition or state. It has a scale along with units of measurement. Indicators should identify the cause/effect relationship between the students, staff and the learning environment and determine the effectiveness of particular actions taken by decision-makers. Once defined and measured, these indicators can then be used in conjunction with the Adaptive Management Strategy in applying the four decision-making principles.

It is beyond the scope of this paper to identify these indicators. However, two sets of indicators that can be developed for use by education managers are defined (World Tourism Organisation, 1996). Core indicators are usually used at the higher management levels, and developed by a state or national task force. These should be applicable to all educational institutions. Supplementary indicators are applicable to particular learning environments (primary, secondary etc.) and types of institution (university, TAFE or school). These could include measures of stress, use intensity, quality assurance and planning processes.

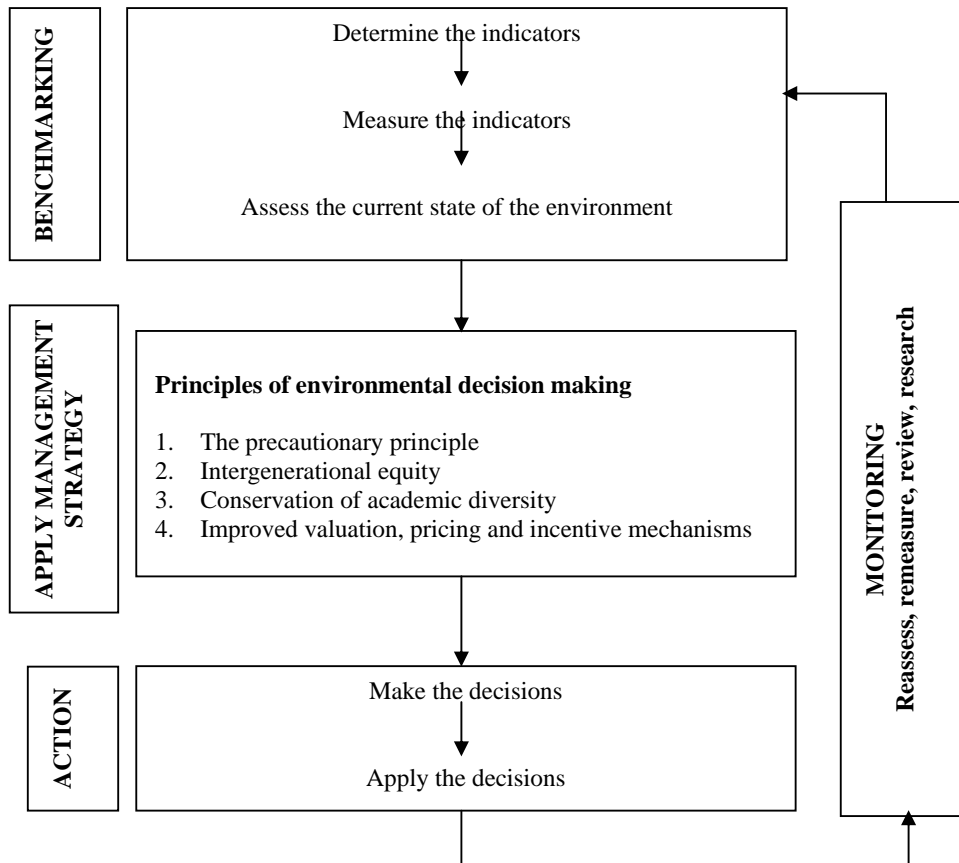


Figure 2 An Adaptive Management Model for sustaining quality learning environments

The final, essential, stage of the benchmarking process is to use the measurement of indicators to assess the current state of the environment and to inform further action. Changes in indicator measurements reveal information that requires interpretation (World Tourism Organisation, 1996).

Step 2 - Application of a management strategy to inform decisions

The Rio Declaration of 1992 was a milestone in defining ecologically sustainable development. The Rio Declaration outlined four principles to be considered in environmental decision making (Bates, 1995):

- the precautionary principle;
- intergenerational equity;
- conservation of biological diversity, and;
- improved valuation, pricing and incentive mechanisms.

If we are to make informed decisions in the learning environment, then it is proposed that these principles be adapted and adopted as the management strategy in the decision-making process in educational institutions.

1. The precautionary principle

The precautionary principle is now a formal principle of international law (Myers, 2002). The principle states that; when an activity raises threats of harm to human health or the environment, precautionary measures should be taken to minimise the harm, even if some cause and effect relationships are not fully, scientifically, established (Bates, 1995). There are many different versions of the precautionary principle, each of which is based on the three core elements: potential harm, scientific uncertainty, and precautionary action (Myers, 2002).

For educational management, the precautionary principle could be stated thus:

Take precautionary measures until you have determined the consequences of any environmental action on the many facets of the learning environment.

The significance of this principle is to prevent the administration and individuals making decisions where the impact of the decision is uncertain. An example is the common use of enrolment numbers to determine the ‘viability’ of a particular course. Courses with low enrolments can be terminated. Low enrolments are not necessarily an indicator of a less valuable ‘resource’, simply indicative of a small population. *If we equated the value of the natural environment with population numbers, then how would our endangered species fair?*

It is suggested that the precautionary principle will be most effective if specific values, in the form of goals, are allowed to guide the entire process from the beginning to the end (Myers, 2002). This would unite the various players in the whole learning environment, teachers, administration and general staff, to work towards that common goal. A main goal in the learning environment should be to maintain a quality, student-centred, learning environment. However, achieving this goal should not be at the expense of the longevity of the entire educational environment or future generations of students and staff.

Criticism has been levelled at the precautionary principle in its practical application (Chase, 1997 and Appell, 2001). The application of the principle can not only help prevent a disaster, but may also hinder progress. Many a university or tertiary institution is guilty of incubating a ‘dinosaur’ course, of value only for its exotic nature as a ‘relic’, its origins long since lost in the mists of time. The existence of the ‘relic’ with its associated teaching staff, may hinder the development of courses or subjects which are important to today’s, or future generations of students. Evolution in the learning environment sees the replacing of old subjects, courses, or technologies (see Case Study) with new ones, better equipped to serve current students’ needs.

When the future of a university course, subject or perhaps technology is being decided (see Case Study), judicial use of the precautionary principle may prevent decisions which could have a detrimental effect on the learning environment and its current or future inhabitants. The precautionary principle has an important place, if none other than to “*require [educationalists] to raise their social consciousness*” (Appell, 2001), and to articulate uncertainties and think out consequences, “*It is an organizing principle in theory - it takes our ideas and makes sense of them*” (Myers, 2002).

2. Intergenerational equity

A simple explanation of intergenerational equity applied to sustainable development is:

“development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Beder, 2000).

In the learning environment one should have a moral obligation to provide for future generations that have no say in today’s decisions. This is the essence of intergenerational equity. Options need to be kept open and diversity maintained to keep sufficient flexibility in the educational system to adapt to current and future changes.

As universities and organisations such as TAFE embrace online teaching and learning one sees a number of examples of potential problems in maintaining intergenerational equity. Experience in many tertiary institutions should make one wary of using these ‘new technologies’ (Smith, 2003). Many educational institutions have a policy (written or unwritten) to encourage the use of ‘new learning technologies’ (TAFE NSW Riverina Institute, 2002; Teaching Technology Implementation Committee, 1995). If future generations of TAFE or university students are to benefit from online courses, a holistic approach to managing online teaching and learning needs to be implemented (see Case Study) so that online teaching and learning can be sustained and used to its fullest potential (Buchan, 2003). Online teaching and learning has not yet reached its potential. Future generations in many educational institutions could be disadvantaged if online learning environments are not managed correctly.

One also needs to consider *intra-generational equity* (Beder, 2000). Equity in the learning environment means that there should be a benchmark of quality below which no environment falls. In the learning community, everyone should have equal access to educational resources and opportunities. Just as inequities are a major cause of environmental degradation (Beder 2000), so inequities in education can affect the quality of the learning environment which then impacts on the current generation of students and academic staff. The significance of this in sustaining quality learning environments is that no student, academic or support staff member should have to carry a greater burden than the rest of the educational community. For example, in universities, courses with fewer students should not have higher price tags or less importance in administrative decisions than those with large student enrolments. Other inequities in education may include teacher workloads, resource access and online access.

3. Conservation of academic [biological] diversity

For the purposes of application to learning environments, ‘biological diversity’ can be translated into conservation of academic diversity. Agricultural experience in cropping has shown the dangers of monoculture (growing a single plant species). The invasion of the crop by a pest species could decimate the crop. Monoculture in educational environments is equally risky. To use a single medium of delivery, such as traditional face to face, is to limit academic diversity. Institutions which do not diversify into flexible modes of delivery such as traditional (print based) distance education, online or blended delivery are exposing themselves to losing students (and staff) to other learning environments, and leaving themselves with an unsustainable population. In addition, in the light of current economic rationalisation, and increased accountability, failure to respond to external influences such as financial concerns and the changing demands of students (Charles Sturt University Strategic Plan, 2002) is to place at risk the future of the learning environment.

In conserving educational, or academic diversity, it is a subjective decision as to what (or who) one conserves. It comes down to placing a value on a subject, discipline or research speciality, and even on individual teachers or lecturers.

4. Improved valuation, pricing and incentive mechanisms

The final principle in environmental decision making is to improve valuation, pricing and incentive mechanisms. In the current tertiary learning environment in Australia, courses that pay their way will cement their place in the learning environment. They may not necessarily be the best solution for the long-term future of the learning environment, but it means immediate survival and financial success (Richardson, 2003).

To assist the decision-making process, one must put a value on education. There are many possibilities: the course fee charged, what the government is prepared to pay per student, the potential salary one can earn after graduating, what an individual is prepared to pay.

The value of education is strongly culturally and individually biased. It is particularly highly regarded in some African or Asian countries where education makes a significant difference to allowing one to simply secure a future and perhaps move upwards in society. Like many things, the harder it is to obtain, the more value it is perceived to have.

Overseas students are often willing to pay higher fees for an Australian education than our own citizens. This is the temptation of overseas markets for Australian courses and it begs us to ask the conscience question, are academics looking to share their expertise with a new generation of students? Are they looking to the student dollar to prop up those less financially viable courses, or simply to survive? The 2003 Federal budget may have determined the pathway that Australian universities must follow. The challenge for educators now is to prevent education becoming simply a commodity to be sold, at whatever cost to the learning environment. This is where the potential for this Adaptive Management Model comes in. Built-in is the recognition of the impact of economic and other external influences on the learning environment and the need to manage these.

Step 3 – Action

After the decisions have been made, an appropriate course of action needs to be taken. Action is seen as either active, or reactive. One can actively manage within one's own sphere of influence or scale of operation. For example, a university Head of School is able to manage his staff, students and their resources, and may have input into some decisions at a higher level in a university. He is, however, less able to influence decisions made by the university senate, or state or federal governments and can only provide *reactive management* to these decisions.

Step 4 – Monitoring

The final step in the adaptive management model is the monitoring process. This step is essential in order to test the effectiveness of the decisions. Monitoring involves reviewing the learning environment to see if the actions taken have had the desired effect. It involves re-measuring indicator performance and reassessment of the current state of the environment. This will inform any further course of action. At its simplest, one may look at whether the students have improved on their tests, course enrolments increased or, in the online environment, current state of forum use (Burr, 2003) and then determining what actions might have contributed to any changes noted.

Case study

Online learning at Charles Sturt University: A strategy for the future

The changing nature of educational provision, in particular the online education environment, is challenging educational institutions. Charles Sturt University (CSU), as one of the largest providers of tertiary level under-graduate distance education in Australia is currently in the process of reviewing and redefining its online learning environment in order to achieve a sustainable learning environment that is adaptable to the changing needs of students (Rebbechi, 2002). This brief case study gives a hypothetical view of how the Adaptive Management Model could be effectively used to manage the university's online learning environment.

The CSU review process has all the ingredients for an extremely successful environmental outcome. The Adaptive Management Model provides the framework to draw these ingredients together in a more holistic manner, and to ensure that the online learning strategy being developed can be successfully implemented. The strategy should lead to long-term change and a sustainable online learning environment.

Benchmarking

The CSU Strategic Plan (2002) defines some key performance indicators by which the university's achievements in learning and teaching will be gauged. Some suggestions of measurement methods, such as course experience questionnaires, are also given. The important step in the benchmarking process is to then take these measurements and use them to assess the current state of the environment. An example of this is a study of participation rates within CSU's online environment (Burr, 2003).

Apply the management strategy

The principles of environmental decision making are clearly demonstrable in the CSU process.

The **precautionary principle** is demonstrated in action in the CSU 1995 Teaching Technology Strategy (Teaching Technology Implementation Committee, 1995; Smith, 2003). The aim of this strategy was, "to provide the direction for Charles Sturt University in the use of technology for teaching, learning, and administrative support, into the 21st century". This ensured that the online learning environment did not develop in an *ad hoc* basis, responding reactively to external environmental impacts, "...developments need planning to ensure compatibility and to encourage consumers to accept the changes" (Teaching Technology Implementation Committee, 1995). Decisions and action between 1995 and 2002 have now been reassessed (part of the *monitoring* process) in the light of continuing changes in the external educational environment. Rebocchi (2002) revisited the online strategy and found that failure to act on certain issues, such as the introduction of mandatory computer access, "has left CSU in a difficult and potentially unsustainable position as it struggles with a system that requires the provision of distance education in both online and print form."

However, although the failure to mandate Internet access is a functional problem in course delivery, the action conforms to an important principle of environmental decision making, **intergenerational equity**. Mandating Internet access raises the problem of equity of educational provision among students (Flexible Learning @

CSU, 2003) which could be a significant factor in CSU which has a strong regional engagement.

In December 2002 the establishment of an Online Learning Strategy Working party was approved. The working party has coordinated extensive consultation with students and staff at CSU “to ensure that adequate procedures are considered to ensure quality of teaching is maintained, our shared aims for graduate outcomes are achieved, and that there is no hidden cost-shifting to students involved in this proposed reform” (Flexible Learning @ CSU, 2003).

This process ensures that the second principle of environmental decision making is adhered to, maintenance of **intergenerational equity**. Feedback from the consultations and working party should also inform the **conservation of academic diversity** (principle three).

The fourth principle, **improved valuation, pricing and incentive mechanisms** would need to address, in a coordinated manner, a number of issues such as course pricing, and allocation and budgeting of academic staff workloads to include teaching online (Rebbechi, 2002; Berge, 1998). In addition, current costing of course materials would need to be addressed. Many staff are embracing different technologies and developing supporting CD ROM, audio or video material for their courses (CELT, 2003). However, current production and costing methods for CD ROMs potentially puts the costs of using these resources beyond the individual school and student budget (Centre for Enhancing Learning and Teaching Learning Media Laboratory Manager, Wagga Wagga, personal communication, July 30 2003). This is to deny students and staff the right to high quality resources.

Action

The action step in adaptive management regarding the online strategy for CSU is yet to take place. The decisions on direction are currently being made (August 2003) in response to the data and feedback received from the consultation processes and deliberations of the working party. These decisions will then need to be applied.

Monitoring

In this final step, the learning environment must be continually monitored to assess the effectiveness of current actions. Monitoring requires one to reassess, research and review the current state of the environment. This was effectively demonstrated at CSU when the Teaching Technology was reviewed (Rebbechi, 2002) leading to the establishment of the Online Learning Strategy Working Party. CSU has also done significant research into moving towards increased flexibility in learning and teaching (Palaskas and Muldoon, 2003a), and investigating the learning and teaching implications of adopting a commercial course management system (Palaskas and Muldoon, 2003).

Conclusion

The Adaptive Management Model introduced here shifts the boundaries on the paradigm of educational management. It is a model that can be used by educators at all levels to make decisions in managing learning environments. One may not be able to actively control the external factors influencing the learning environment, but must at least learn to manage for them.

So what is the future for the learning environment? For most, one hopes it will be survival, but along the way there will be changes and small pockets of extinction. Many hard decisions have yet to be made in natural resource management to ensure our long-term future. Education, a precious resource, could be in danger of heading the same way as our natural environment. We will be in a position to sustain quality learning environments once they are truly valued. As soon as something has an intrinsic value, its future is secure. As seen in nature, value is subjective and very personal.

“It is in their role as citizens, not consumers, that individual people will create a sustainable [learning environment] ...it is through collective political choices that Sustainability will be achieved” (adapted from Jacobs, 1991). Educators at all levels, from classroom teacher to lecturer, campus manager to vice-chancellor, are called on to place a value on education and to nurture a sustainable learning environment. Educational managers are challenged to adopt this Adaptive Management Model to guide their thinking and decision making. If this action is only to demonstrate caution prior to decision making, then we are on our way towards sustaining and improving quality learning environments.

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