Successful Environmental Education: Adapting to the Educational Habitat

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Abstract As a matter of survival, we need to educate current and future generations to live sustainably. We need to ensure that future generations have access to quality environmental education.

This paper provides guidelines for educators and managers to use to better understand and manage the learning environment in which environmental education, particularly sustainability, programs take place. This is done through the introduction of two tools. Firstly, through a model of the learning environment that can be used to understand the educational environment and its various interactions and secondly, through the introduction of an Adaptive Management Conceptual Framework. This framework provides a step by step approach to guide the process of assessing the state of the current learning environment, and to guide the processes of decision making and implementation by educators.

These tools have broad application to a variety of educational environments; schools, universities and community education. A specific case study of the application of these tools in a university environmental science degree is outlined.

Introduction

Education is the way knowledge, ideas and skills are passed on from generation to generation. The learning environment, including the home, the community and 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) and administrators can be forced to make decisions based on financial concerns, without addressing the long-term effects on the people concerned. Environmental sustainability educators will be all too aware of the effects of factors such as funding cuts, political pressures and social changes on their learning environment, no matter what the (perceived) importance of what they are doing.

This paper provides guidelines for educators to use in better understanding and managing the learning environment in which environmental sustainability education programs take place. This is done through the introduction of two tools. Firstly a model (Figure 1) is given which can be used to define the educational environment and its various interactions. The model is used to focus the educator on their potential sphere of influence in order to manage the impact of external environmental factors on the learning environment.

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Secondly, an Adaptive Management Conceptual Framework is introduced. This is designed to be used by educators and educational managers at all levels, from community to school and university, to improve their specific educational environment and to ensure the improvement and sustainability of education initiatives. The Adaptive Management Conceptual Framework (AMCF) provides a step by step approach to guide the process of decision making and implementation by educators, and to manage the inevitable change within the educational environment. The AMCF gives a holistic and long term approach to managing individual learning environments and importantly, ensures that the decision making processes controlling environmental sustainability education programs are grounded in appropriate values. Environmental sustainability education programs should be a fundamental part of our survival and it is only once something has an intrinsic value that its future is secure.

Defining the Environment

In order for any system to be sustainable, one must understand each component and how these interact with, and affect, other components in the system. The learning environment itself must be viewed as a dynamic system if sustainability educators are to successfully implement environmental education initiatives. Figure 1 models a typical institutional learning environment and its components: the students, teaching staff, administration and their interactions with one another (Buchan & Buchan, 2003). Those operating within the learning environment are able to control and influence within this sphere. Impacting on this environment are the external environmental components; economics (e.g., lack of funding), social (e.g., staff changes), physical and political, which generally cannot be directly controlled but do need to be managed.

This model can be adapted for a variety of learning environments from a school classroom, to community education program or university degree course (see case study, Figure 3). It is important for educators to understand their sphere of influence, with attendant limitations, when planning and managing programs.

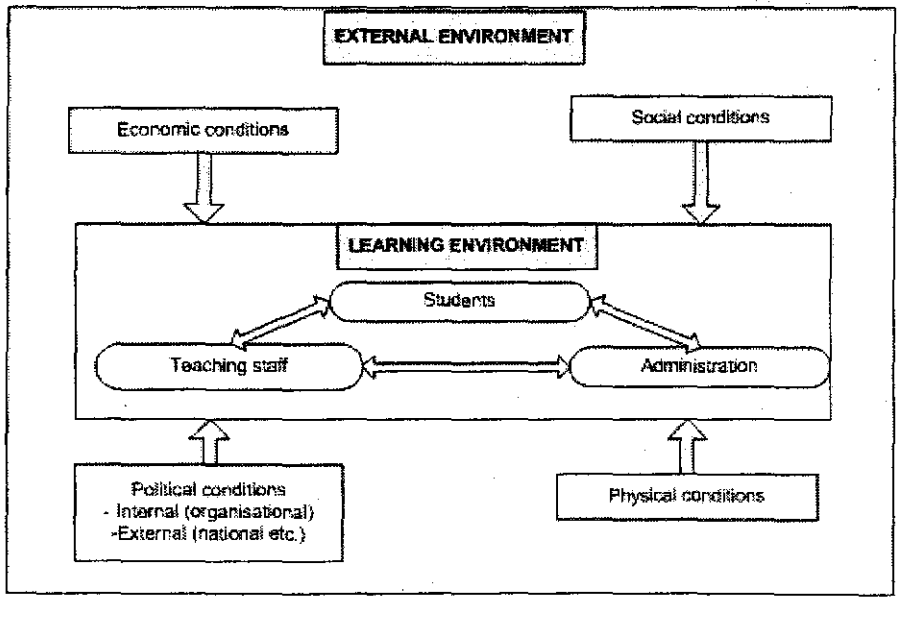

FIGURE 1: Model of the learning environment

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Introducing Adaptive Management Techniques

It is only when one fully understands the learning environment in which environmental sustainability education is to take place, that one is then in a position to make management decisions to sustain that learning environment.

Adaptive management techniques have been used in natural resource management in an attempt to manage the uncertainty and complexity associated with natural resource management (Lee, 1999; Allan & Curtis, 2003a). Adaptive management is based on learning from management actions in order to improve the next stage of management (Allan & Curtis, 2003a). In order to assist environmental educators to manage the inevitable change within the educational habitat the author has developed techniques from adaptive management for use in the educational environment. These techniques underpin the development of an Adaptive Management Conceptual Framework (Figure 2) (Buchan & Buchan, 2003; Buchan, 2004). Sustainability education is still a relatively new and developing area, as highlighted at the February 2004 Effective Sustainability Education Conference (Sydney) with its theme of "What works? Why? Where next? Linking Research and Practice" (available online from http://www.epa.nsw.gov.au/cee/conference.htm). The use of adaptive management in environmental education is significant because it provides a means by which educators can learn from their management actions to continually improve the way in which education programs are delivered, and to remain responsive to changes in the educational environment.

A number of different types of adaptive management have been described. Evolutionary adaptive management describes a trial and error approach to management, while passive adaptive management uses lessons from the past to develop a single best policy to apply in practice (Allan & Curtis, 2003; 2003a). Active adaptive management "... is a designed, purposeful and reflexive system that grows,

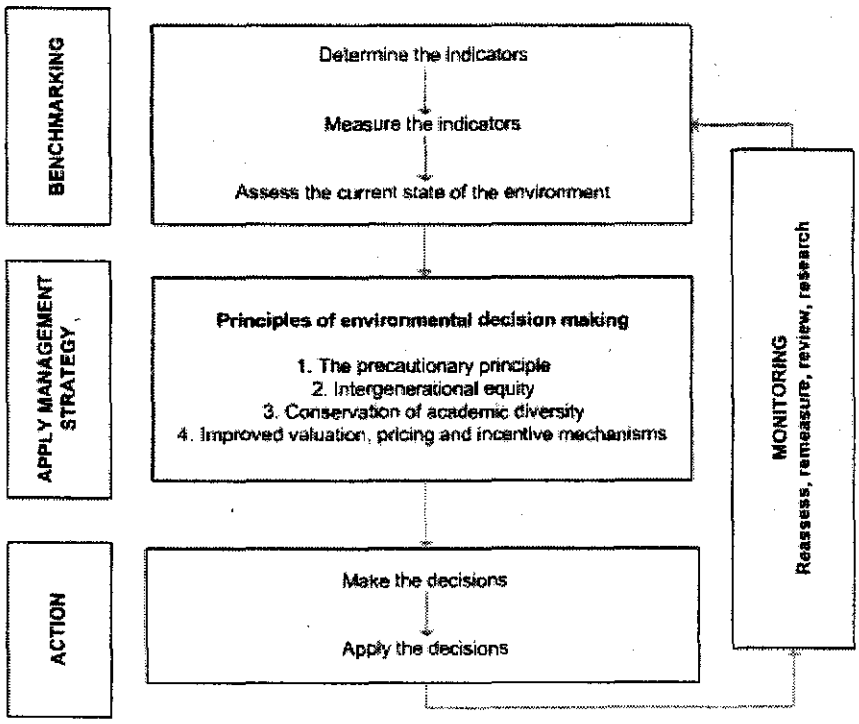

FIGURE 2: The Adaptive Management Conceptual Framework

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assesses and builds the capacity of stakeholders to manage change" (Allan & Curtis, 2003a) and is advocated for use in sustainability education.

The Adaptive Management Conceptual Framework (AMCF) is designed for use at all levels; by teachers, community educators and institutional managers. It is a powerful tool that can be used to guide the integration and implementation of programs and curriculum into both institutions and community groups. The AMCF outlines a four-step process:

1. benchmarking to assess the current 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 in achieving the desired outcomes and to inform future action.

These steps are described in detail in a previously published paper (Buchan & Buchan, 2003).

Although the AMCF is similar to the action research model used in education, the significant difference is that this framework requires educators to make important decisions based on values. It is embedded in a long term understanding of the larger learning environment (Figure 1), unlike the action research model which is "usually conducted by teachers, administrators, or other educational professionals for solving a specific problem or for providing information for decision-making at the local level" (Wiersma, 2000, p.11).

The first step, **Benchmarking,** ensures that benchmarks are set, measured and reviewed. In this three step process, indicators are first determined and second, measured. Finally, using these benchmarks the current state of the learning environment is assessed and this assessment will determine the need (if any) for further action. (If the program/course is working well, there is no need for further action, yet.)

The second step, **Applying a Management Strategy** is based on four principles of environmental decision making (Bates, 1995). By using principles of environmental decision making, sustainability educators have to set down those intrinsic values important in the particular learning environment.

For educational management, the first principle, 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" (Buchan & Buchan, 2003). The significance of this principle is to prevent the administration and individuals making decisions about education programs where the impact of the decision is uncertain. For example, a common practice in universities is for administration to use course enrolments as an indicator of course viability. Low enrolment or attendance numbers 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, how then would our endangered species fair? The precautionary principle applied might see a course or program low in numbers being retained in the short term, with minor adjustments, prior to a major review of the impact of perhaps cutting the course or program altogether. The case study demonstrates the precautionary principle in action in a university course.

A simple explanation of the second principle, **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). The essence of intergenerational equity in the learning environment is that one should have a moral obligation to provide for future generations that have no say in today's

decisions. Options need to be kept open and diversity maintained to keep sufficient flexibility in the educational and social system in order to adapt to current and future needs in environmental education. This is particularly important in sustainability education which is relatively new and still developing.

An example of intergenerational equity in action is seen in a post-graduate ornithology course at Charles Sturt University, NSW. Here certain subjects with small enrolments (e.g., "Avian systematics" and "Captive Avian Management") are retained because the knowledge and techniques included are not available to students through distance education anywhere else in Australia.

For the purposes of application to learning environments, **conservation of biological diversity** (Principle 3) can be translated into the conservation of academic diversity. In environmental education this means maintaining a diversity of teachers, subjects, programs and delivery modes. A single mode of delivery, or style of environmental program might be successful for a given audience at any one time. However, if it remains static, as soon as there is some external environmental change (funding withdrawal or political pressures etc.) the environmental educational program becomes a "threatened species" facing extinction. The conservation of academic diversity would allow the learning environment to "adapt" to these changes so that sustainability programs continue.

The final principle used in the management strategy is to **improve valuation, pricing and incentive mechanisms**. To assist the decision-making process, one must put a value on education. The value of education is strongly culturally and individually biased. This is the real challenge for environmental sustainability educators; not only placing a value on sustainability education, but getting the receivers of, and more importantly, those funding that education to value it.

After making the management decisions, Step 3 in the AMCF is to actively carry out those decisions. Action can be either active or reactive (Buchan & Buchan, 2003). Using the model of the learning environment (Figures 1 and 3), a university subject coordinator can actively make decisions concerning the course content, assessment changes and delivery methods (i.e., within his/her sphere of influence). The subject coordinator can, however, only manage "reactively" the external environmental factors, e.g., funding cuts within the university or upper management levels and staffing changes.

Step 4, the **monitoring process** is perhaps the most important step. Monitoring involves reviewing the current state of the environment and re-measuring indicator performance to test the effectiveness of the management decisions and to make necessary changes to practices based on the monitoring outcomes. It also involves directed research that can inform the processes and decisions at varying stages in the adaptive management process.

The case study below demonstrates the application of the tools described above.

Case Study

This case study outlines the application of the Adaptive Management Conceptual Framework to the review of a university degree course, Charles Sturt University's (CSU) Bachelor of Environmental Science (Management) course.

Background

All CSU courses undergo regular, mandatory reviews approximately every five years. Individual subjects are also regularly evaluated, at least once every three years according to university policy. The B.Env.Sci (Management) course is now in its third year, with the first group of students about to graduate. The course coordinator has

chosen to review the course at this stage (rather than wait the statutory five years) and to adopt the AMCF as a tool to guide this review process. She feels that using the AMCF will help ensure that the course review process is ongoing and that constant and regular feedback from students and staff *does* inform decisions and ensure continual improvements to the course (see Table 1). The course coordinator's decision was also influenced by a presentation by academic staff from CSU's School of Community Health, where they shared their experiences in the process of teaching collaboration and use of student focus groups as part of their ongoing course review process. This process ultimately led to the group being awarded the CSU Vice-Chancellor's Team Teaching Award in 2002.

The CSU B.Env.Sci (Management) is a three year degree course offered through the School of Environmental and Information Sciences (Albury, NSW). Students can choose from four different specialisations: Conservation Ecology, Cultural Heritage, Protected Areas or Recreation. Within these specialisations there are core subjects studied at first year level, with various electives being offered in the second and third years of study. Most subjects are offered both internally (on-campus classes) as well as externally (i.e., by distance education, DE).

Methodology

In carrying out the course review, the course coordinator consulted other academic staff and the School's educational designer before deciding to use the AMCF to guide the review process. The next task was for the course coordinator to define and understand her learning environment, and sphere of influence (Figure 3).

Through discussions with the educational designer and other staff, the course coordinator has taken the AMCF and worked out a timeline of implementation (Table 1). A brief description of progress on each step in the AMCF is given below.

Step 1 – Benchmarking

This case study is currently in the **Benchmarking** phase. Information on curriculum, and individual subjects is being collected and collated and preparations are being made for the student forum in November 2004. Indicators are being established which will form the basis for measurement in the monitoring phase.

To date these indicators are:

- student satisfaction with individual Subjects (subject survey);
- student satisfaction with the course (course survey/course experience survey);
- employer satisfaction with graduates (graduate survey); and
- subject outline consistency – checking assessment guidelines, assessment tasks, ensuring subject content matches with official subject profiles, and the currency of resources such as textbooks, video or CD ROMs.

(At CSU every subject has a Subject Outline which contains an introduction to the subject, all basic information on assessment guidelines and university rules and policies, a study schedule and lists of useful resources. Subject outlines are made available in print, as well as on-line.)

Step 2 – Apply Management Strategy – Principles of Environmental Decision Making

It is apparent from this initial phase of course review that the different steps in the AMCF cannot be entirely separated and that it is important to start looking at the Principles of Decision Making while Benchmarking is in progress, particularly with respect to the **precautionary principle**. Initial investigations in analysing individual

TABLE 1: Proposed application of the Adaptive Management Conceptual Framework to the Bachelor of Environmental Science (Management)

Stage	Activity	Timeframe	Who
1. Benchmarking	Curriculum mapping	August to November 2004	Course coordinator Research assistant
	Student Forum (focus group)	November 2004	Course coordinator Research assistant
			Surveys
Evaluation			Course Survey
Evaluation			Graduate Survey
coordinator			Comparison with other Env. Science
			consultation
			2. Management Strategy-Decision Making
ttee			Consider Principles eg precautionary, equity valua
ttee			Determine priorities for change
			changes
ttee ual course bject ators			**3. Action**
ttee coordinator ch assistant ional er (CELT) Course ators			**4. Monitoring**
ttee			Student retention
Evaluation			Course Survey
ttee			Graduate surveys

Trial changes

Focus group every semester to get student feedback on subjects and course as a whole.

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The CELT Evaluation Unit educational designers assist g issues.

*CELT is the Centre for Enhancing Learning and Teaching at C conducts all the official course and subject surveys for the u academic staff in preparing materials for teaching and consult on

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subjects, and their subject outlines have thrown up a number of inconsistencies. While no major changes will be made to subject content prior to results from the benchmarking process, the precautionary principle has been applied here. The educational designer and subject coordinators responsible for the production of distance education subject materials and all subject outlines are acting on the findings so far by ensuring consistency in the 2005 B.Env.Sci. (Management) subjects with respect to assessment guidelines and other key areas.

Initial observations and discussions suggest that one of the hardest things might be to establish **improved valuation, pricing and incentive mechanisms**. Informal feedback has indicated that students find it difficult to value certain core subjects as highly as they do others; the content perhaps being less "interesting" and immediately useful than that of other subjects. However, application of the principle of **maintaining academic diversity** here is ensuring that these subjects are retained so that students acquire important skills that they may one day need later in the course, or in a future job. Results from the student forum focus groups may well see a restructure of certain core subjects to make them more relevant to students. In addition, it is emerging that there may be a need to create a new course, the Bachelor of Conservation Ecology, in response to the increased value perceived in this discipline in recent times. Results of benchmarking and the comparison of the B.Env.Sci. (Management) course against other universities' Environmental Science courses, along with industry feedback, will inform this decision.

Maintaining academic diversity is also applied at the individual subject level. Benchmarking is assessing the diversity of subjects, the diversity of assessment methods, residential school programs and types of learning activities in the different subjects.

Step 3 – Action

The course coordinator is ensuring that any decisions made are grounded in reality, and within her sphere of influence (Figure 3). This is done through the process of assessing the feasibility of any changes and prioritising these changes within the current environment (i.e., funding constraints, staffing, and administration limitations). While funding and administration is often restrictive in the university environment, they could be placed within the course coordinator's sphere of influence (Figure 3) because, if one believes in something strongly enough and is pro-active, then one has a chance to achieve the desired outcome.

This case study is an ongoing exercise and it is intended that the full results of this review will be published once the first cycle of the AMCF has been completed. It is important to note that this study is being funded through certain research grants obtained by the lecturers involved. This emphasises the importance of the AMCF, and being able to place a value on education. The lecturers have chosen to spend the money on researching their teaching, and the learning environment, as a priority.

Step 4 – Monitoring

This commitment to funding the initial stages of the process is commendable. However, in the long term it has not yet been established how ongoing monitoring will be funded. The value of adopting the AMCF as a long term course management tool is that the monitoring process and reassessment of the other steps in the AMCF can ideally be built into future academic workloads and not be a once-off "burden" faced every few years.

In addition to reviewing the environment, an important part of the monitoring process is research. Research has already informed the choice of course review process

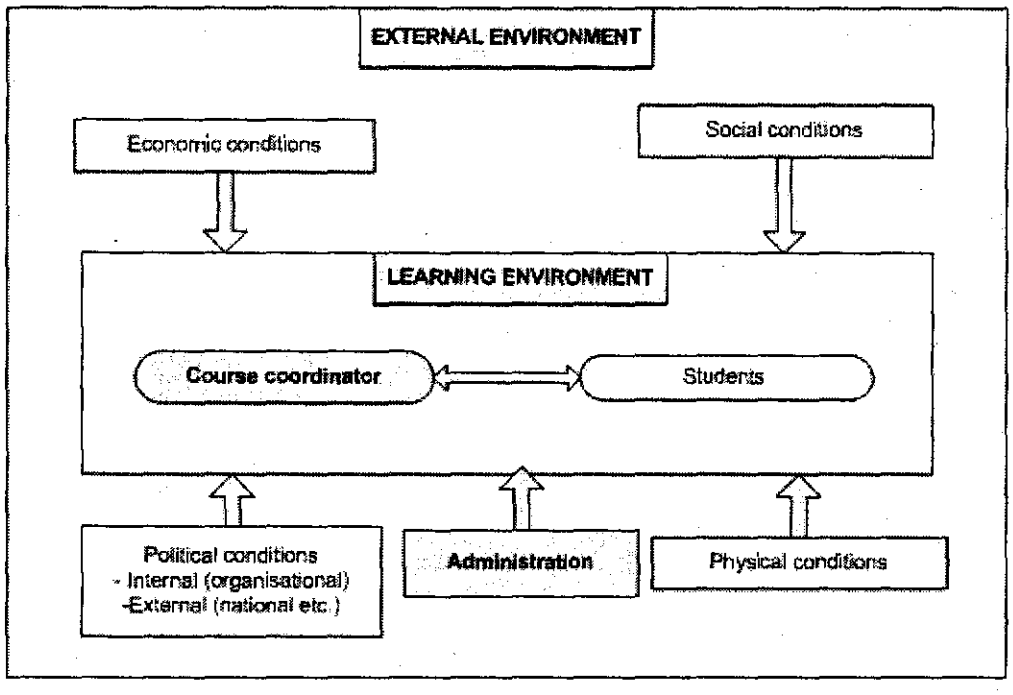

FIGURE 3: Model of the Bachelor of Environmental Science (Management) CSU learning environment illustrating the course coordinator's sphere of influence

with the course coordinator learning from the experiences of academic staff in other schools, the educational designer and the literature to ensure the success of the course review process. The potential problem of a long term commitment encountered here is acknowledged in the research on adaptive management (Stankey et al. 2003), and is an area for caution in further developing the AMCF.

Potential Applications of the AMCF

A potential use of the Adaptive Management tool has been given in the hypothetical case study, "Online learning at Charles Sturt University: a strategy for the future" (Buchan & Buchan, 2003). It remains for the moment hypothetical because of the challenges of persuading higher management to adopt the principles of adaptive management (Stankey et al. 2003).

The AMCF has been put forward as a method to guide the process of a CSU Scholarship in Teaching Fund project. Briefly, the project looks at the university's new Performance Based Funding model, designed to improve the quality of teaching in the university. Using the AMCF will help investigators to benchmark the current teaching environment at the university, and to ensure that results from the study feed back into concrete actions and ongoing improvements to the Performance Based Funding model.

The tools introduced in this paper should be of particular value to sustainability educators in a variety of spheres. For the community educator the learning environment is not as easily defined as in the school or university environment, and funding for programs perhaps more tenuous. However, the model of the learning environment (Figures 1 and 3) can help the community educator to define their potential sphere of influence and to become aware of the external environmental factors that may impact on the delivery of sustainability education programs. The AMCF can then be used to manage those community education programs in a sustainable way.

Conclusion

If environmental education programs are to work, they themselves must be sustainable in the long term and adaptable to the changing needs of individuals and society. The aim of this paper has been to give lecturers, teachers and community educators guidelines to define their own learning environment and to understand the external environmental factors influencing this (Figure 1).

In order to guide the development of sustainability education programs and to cater for inevitable change and uncertainty, adaptive management principles from natural resource management have been introduced. As environmental educators we need to be open to change and the lessons learned from the review of current practices in this evolving field (Lee, 1999; Shindler & Cheek, 1999; Allan & Curtis, 2003, Johnson, 1999). While the testing of the concepts presented in this paper is still in its early stages, the case study included demonstrates how the Adaptive Management Conceptual Framework could be used to continuously improve and sustain a university environmental degree course. Suggestions have also been made for other potential uses.

Introducing adaptive management to the educational environment shifts the boundaries of the paradigm of educational management. It ensures that management of the learning environment is holistic; that the decisions made feed into actions and the effects of those actions are measured, with any necessary improvements made in the future. Most importantly, it ensures that the decision making processes controlling environmental sustainability education programs are grounded in appropriate values. Environmental sustainability education programs should be a fundamental part of our survival and it is only once something has an intrinsic value that its future is secure.

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Keywords: sustainability; environmental education; learning environment; adaptive management; action research.

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