

PROBLEM BASED LEARNING

the ability to conduct independent inquiry into real-life issues

Jason MacVaugh, University of Gloucestershire Business School and the Centre for Active Learning

Introduction

In a recent public lecture on the topic of sustainability I attended, a member of the audience asked, ‘Why should sustainability require even more education? - we have been telling students about these issues for twenty years.’ A good point, some might say: there has been a significant amount of effort spent educating young people on a range of sustainability issues. Unfortunately, for all our *telling* people about sustainability, we have failed to provide an education that would lead to them *doing* something about it.

This chapter will argue that a better approach is the application of problem-based learning (PBL) pedagogy to sustainability education, since this would allow students to gain skills in solving practical real world problems. First a justification for PBL is given. Next a description of some of the more straightforward PBL tools and techniques are highlighted, with a focus on those that help embed sustainability into an education program. Issues of resistance to such programs and what to do when this is encountered is also discussed. The chapter concludes with a bibliography of useful resources for those interested in learning more about PBL and sustainability education.

Why Problem Based Learning?

While in the last fifty or so years many educators have become accustomed to a Didactic model, where accumulated knowledge is efficiently dispensed to large numbers through lectures or reading exercises, few would argue with the axiom that we learn best by participation. *Active Learning* is a generic term for teaching pedagogies that require the educator to privilege the learner’s participation over his or her own declarative knowledge of the subject. I believe that *Problem Based Learning* is a very suitable ‘active’ pedagogy for sustainability education because it focuses the learner on *problematization, problem investigation, problem solving* and *critical reflection*.

Problematization asks the learner to consider what they already know about a specific issue, what is problematic about this knowledge, and, most importantly, what is not known. This process is suited to sustainability education as it takes into account the learners existing ability, asks them to problematise the issue for themselves, and in doing so begins a shift in attitude with a *bias toward action*.

Problem investigation requires the learner to consider the elements of the problem as currently understood and seek out knowledge leading to an understanding of the dimension,

content, location and known solutions to the problem. Given what is already known about sustainability issues, it is important that learners cross disciplinary boundaries in their search for knowledge, to locate the problems within frameworks of current understanding, and to seek *trans-disciplinary solutions* yet to be discovered.

Problem solving provides the learner with an opportunity to act, and to show that their learning is more than rumination on unbounded ideas. This is probably the most important element of education for sustainability because success can only come through a significant *change in behaviour*, not just understanding.

Finally, critical reflection asks the learner to evaluate the processes used to solve the problem and to reflect on the significance of the suggested action in light of current understanding. At the same time the learner may also come to understand that *their solution may not resolve the problem*, thus prompting a better conceptualisation of sustainability. An allegory is that of the international student who must learn the language of a new country so that they may live there more effectively in the future, but must also try speaking some of the language to meet the immediate challenges of life each day.

Techniques for facilitation

The key to PBL facilitation is to engage learners in such a way that they find the learning process as natural as solving problems in their day-to-day life. Unlike natural problem solving, PBL also requires learners to become *conscious* and *critical* of the process that they are going through.

Assuming the learners begin with a functioning level of education, comfort with the learning environment and a reasonable level of motivation, the facilitation of a Sustainability course starts with the introduction of a significant problem. It is important that the problem be carefully selected and communicated in such a way that the learner/groups of learners will likely find it pressing, interesting or even discomforting. The objective of problem introduction, also known as a trigger, is to encourage the feeling that the learner needs to resolve the problem. Some common triggers include documentary films, newspaper clippings, field trips or presentations from people working in the field (for a list of examples read Farley et al., 2007).

Educators need to provide the space, support and encouragement necessary to allow active engagement by the learners. Some would suggest the learners deconstruct the problem based on their personal knowledge and/or other resources provided by the educator. Others suggest that after understanding the problem there is an opportunity to illustrate common solutions to the problem and their relative inadequacies. Either way it is important that the learners understand that sustainability issues cannot be easily solved (Steinemann 2003, and see *Coping With Complexity*, this volume).

Given sufficient interest in the subject, learners will begin to move away from seeing the educator as the 'expert,' and will instead begin to construct their own base of knowledge such as evidence of the problem, facts and figures, and yet to be tested solutions. Without a formal set of learning objectives or discipline centred base of knowledge to accumulate, learners can

develop elaborate schema to deal with information they find and a consolidated personal base of knowledge for future action (Savin-Baden, 2003). Facilitators who feel out of place at this stage often opt to provide supplementary lectures on topics on which they have expertise, or may wish to act as the proverbial shoulder on which learners can lean.

Problem based facilitation requires the learner, at some point in time, to apply their knowledge in the form of practical action (such as community service) or artefact (such as a report or digital story). This brings the learner back to the original problem and asks to what extent their solution has dealt with the problem. By this point educators will have probably moved from being the expert instigator towards the role of neutral referee, helping the learners test the solutions and ensure that they are cognisant of (but not necessarily conforming to) any rules of context in which the problem is set.

Given well-chosen problems, motivated teams and some careful attention on the part of the educator, over time the PBL process becomes cyclical. Good PBL will result in the learners and groups evolving their own methods for time management, monitoring systems, worldviews or paradigms, solution testing methods and reflective practices (Salih, www.unescobkk.org). While most educational institutions retain the power to assess, many have given significant leeway for learners to self-assess. If summative assessments are required, it is useful to focus on learner's effectiveness in *dealing with the problem*, developing *independent knowledge*, and *formulating a useful solution*.

Tool for Educators

There is no unitary model of PBL, but at the same time it is also unhelpful to suggest that educators begin the process without 'something in hand.' The following model provides a starting point that could be adapted to suit a particular activity, module, or course based on PBL:

Step	Activities	Timing
1	Facilitator: Introduction of the Problem Everyone: Clarification of terms and concepts	First meeting
2	Everyone: Discussion of the extent of the problem Facilitator: Provision of initial input	First & Middle meetings
3	Everyone: Discussion and listing of explanations Everyone: Formulation of learning objectives	Middle meetings
4	Learners: Collection of further information through private study Facilitator: Ensures adherence to any 'rules of play' and provides learner support	Between meetings
5	Groups: Meet, discuss findings and synthesis Groups: Repeat stages 2-5 as needed	Between & Middle meetings
6	Everyone: Finalising working solutions Everyone: Testing solutions against original problem	Last meeting(s)

7	Everyone: Reflection on process Everyone: Discussion of assessment artefacts	Last meeting
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Dealing with Resistance

Those who have documented the introduction of PBL into their educational institution report great learner success and much personal satisfaction (Biggs, 1999). At the same time their accounts also describe deep and complex layers of resistance encountered before any institutional acceptance of their program. This resistance most often takes the form of *Learner or Facilitator disjunction* (Savin-Baden, 2003), or the ever-present issue of *institutional inertia* (Albanese and Mitchell, 1993).

For learners, disjunction occurs when they begin to feel uncomfortable with responsibilities such as independent research, frame breaking and self-assessment during the necessary shift in learning behaviour from passive to active. Research suggests that learners react to this disjunction in at least four distinct ways: *retreat*, *temporising*, *avoidance* and *engagement* (Savin-Baden, 2003), the first three of which are forms of resistance. To help learners transition to active *engagement* with PBL it is important that educators help the learner see that what they have learned in the past is valuable, what they see as PBL is just as important to the process as any educator-provided rules, and overcoming the challenges of both disjunction and PBL can be just as valuable if not more so than any other ‘traditional’ academic goals.

Facilitator disjunction occurs when experienced educators feel discomfort due to the necessary differences in leading a PBL course over their previous pedagogic approach. This is an insidious form of resistance to PBL, as common reactions such as the *over-imposition of structure*, retaining *traditional assessment methods*, unwillingness to *cross disciplinary boundaries*, and *privileging declarative knowledge* over learners’ personal knowledge, will undoubtedly cause learners to revert to their more traditional passive roles and expectations. Again, this disjunction is almost unavoidable, but it does not have to be disabling. Many facilitators have found success resisting the detrimental affects of disjunction by taking an honest look at their *personal pedagogy* and being realistic about how this differs from the *interactional pedagogy* they are using with PBL groups.

Institutional inertia is familiar to most if not all experienced educators. It manifests itself in the form of budget constraints, multiple layers of administrative bureaucracy, standardised assessment schema and many other deterrents to change. Those who care agree that both sustainability and PBL require a radical rethink of where we are, what we can do about it, and deeper reflection on what could be. To respond to this resistance some educators advocate moving outside of the system, and so run their classroom using PBL while avoiding direct conflict with institutional regulations. Others have physically left traditional institutions and now work in specialist centres of PBL such as McMaster’s University in Canada, or Maastricht in the Netherlands. Neither method results in long-term change, however. For widespread change it is necessary to engage constructively with institutional inertia: using the literature to highlight the value learners ultimately gain from a change to active learning and PBL methods.

Finally, if institutions have sustainability as part of their strategic agenda then it is possible to argue for the value of a problem-based approach, because it has the potential to yield learners who can help achieve a sustainable future, not simply add to the great number of people who are aware but do not act.

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