

### **Purpose**

This is one of a series of guides produced by the Imaginative Curriculum Network to stimulate thinking and promote good practice in curriculum design. This Guide focuses on 'Enquiry-based Learning' (EBL) – on curricula designed around processes of enquiry. It is informed by reports emerging from a programme of staff development that supported lecturers as they each carried out a small-scale project designed to impact on the learning of their students. There is a companion 'Guide for Busy Academics'.

### **Audience**

This Guide has been produced primarily for:

- People who lead course curriculum design or who support other academics in developing the curriculum.
- People who have institutional responsibility for leading developments in teaching and learning.
- Academics wanting to develop or research their own teaching.

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### **Introduction**

What challenges do you currently face in your teaching? Is there a particular ability that you have always wanted your students to develop more fully? Take a moment to consider these questions. You might want your students to engage more critically with a certain area, or to develop their capacity to carry out an extended project. Or you may be concerned about the motivation of your students, perhaps as your class size has increased beyond all recognition.

This guide proposes that Enquiry-Based Learning (EBL) – learning that is driven by a process of enquiry – can address a range of contemporary issues within higher education, as summarised in the second column of Table 1. EBL offers academics the flexibility to help students develop a wide range of abilities, whilst still engaging them in the process of learning.

## Scope of Enquiry-Based Learning

Enquiry-Based Learning (EBL) is used here as a broad umbrella term to describe approaches to learning that are driven by a process of enquiry. We can outline some of the characteristics of EBL as follows:

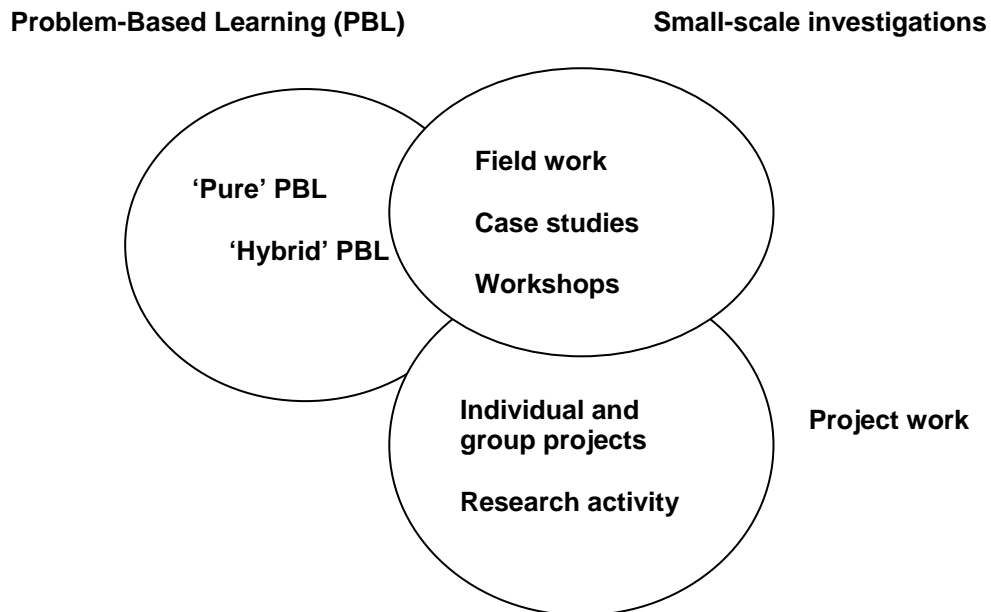
- Engagement – with a complex problem or scenario – that is sufficiently open-ended to allow a variety of responses or solutions.
- Students direct the lines of enquiry and the methods employed.
- The enquiry requires students to draw on existing knowledge and to identify their required learning needs.
- Tasks stimulate curiosity in the students, encouraging them to actively explore and seek out new evidence.
- Responsibility falls to the student for analysing and presenting that evidence in appropriate ways and in support of their own response to the problem.

**Table 1. The match between selected current issues in higher education and enquiry-based learning**

Contemporary issues in higher education		Advantages of EBL
<b>Issues around goals student learning</b>	<i>Employability and the development of skills and personal qualities.</i>	Allows the development of a wide range of abilities: knowledge-creation; team-working; presentation; information literacy; ICT; problem-solving; creativity; project management.
	<i>Gaps in students' knowledge, given variation in prior experiences.</i>	Incorporates a method by which students can identify and fill gaps in their knowledge base.
	<i>Disparity between theory and practice.</i>	Allows theory to be explored within realistic contexts.
	<i>Fragmented learning on modular programmes.</i>	Enquiries involve integration of knowledge.
<b>Issues around the learning process</b>	<i>Traditional passive/transmission approaches foster surface learning.</i>	Typically involves a deep approach to learning; students make their own connections between ideas.
	<i>Divergence between research and teaching.</i>	Draws on staff research interests and skills, and on the research infrastructure.
	<i>Mass higher education can lead to a sense of anonymity and social isolation.</i>	Enquiries conducted in small groups supported by a facilitator, foster relationships and relationships with staff.
	<i>Poor student motivation.</i>	Scope for students to choose the topic and lines of enquiry. Open nature of an enquiry ensures there is scope for more realistic and relevant learning; peer interactions foster engagement.
	<i>Diversity of learner needs.</i>	Students able to work at their own pace, and in their own way, on issues of interest.
	<i>Awareness of the need for sensitivity in teaching methods to the subject and the institutional context.</i>	Scope to adapt the broad approach to a range of scales and using a variety of resources.
	<i>Competitive approaches to learning seen as less appropriate in professional contexts.</i>	Enquiries allow for both individual work on sub-tasks and common work on an overall task.

In defining the territory of enquiry-based learning, there is evident overlap with **Problem-Based Learning** (PBL), in which the handling of a problem defines and drives the whole learning experience of the students. Students are then challenged, within the context of a small group, to define for themselves the issues emerging from the problem, to decide for themselves what further knowledge they require in order to address these issues, to undertake the research they have identified as requisite and to apply that research towards the presentation of outcomes. The curriculum is thus structured by a series of problems, rather than, say, by a systematic presentation of subject content. But EBL, while incorporating elements of PBL, also covers a broader spectrum

of approaches, including **small-scale investigations** and **project work**. Figure 1 illustrates this spectrum.



**Figure 1. Approaches to learning covered by the term Enquiry-Based Learning (EBL)**

Small-scale investigations allow particular scope for adaptation to disciplinary contexts, and can be employed on a scale ranging from individual modules to entire programmes. The use of such investigations was an approach highlighted on the programme of staff development that underpins this guide. Field work, for instance within Geology or Geography, provides evident scope for a series of small-scale investigations, conducted within a limited period of time. Case studies also provide scope for open-ended enquiry, as occurs in Business Studies with scenarios drawn from real life, and with students taking on the role of consultants. These are well-established uses of small-scale investigations that are closely tailored to the nature of the discipline.

However, one might imagine a wider range of enquiries that could be pursued within different disciplines. In particular, enquiries may be framed so that students engage with a specific set of resources, as is evident in Case Study 1 below. Within problem-based learning, for instance, significant time is often involved in the search for relevant resources. If a sufficient set of relevant resources has already been collated then the time for searching will be reduced. Of course, information-searching skills are important, but the course unit may not wish to highlight these. It may be more appropriate to wait for extended pieces of work to allow these skills to develop.

Higher education, meanwhile, has traditionally asked students to engage in large-scale project work or research activity. One might think of product-design projects in Engineering, film production in Media Studies, or research projects within the Social Sciences. The focus of learning is often on the ability to carry out an extended piece of project work, producing a project report or a dissertation.

Savin-Baden (2003), however, notes that such projects are often employed towards the end of a degree programme after a given body of knowledge has been covered and skills in using and analysing knowledge have been developed. The rationale is that the students will then be equipped to undertake the project; it would clearly be unreasonable to expect students to engage in an extended enquiry at an early stage of their studies. The process of producing such a piece of work would also be expected to help students make connections within the body of knowledge to which they have already been exposed.

### **Case study 1: Making a bail application (adapted from Feld and Brogan, 2004)**

Feld and Brogan introduced EBL into a final-year course unit in Criminal Procedure and Evidence on the LLB programme at the University of Western Sydney Law School. Their initial intention was to address the concern that theoretical issues had been marginalized in the existing curriculum.

The enquiry that formed the basis for an element of the course unit was a bail application. The intended learning outcomes related to the students' ability to understand relevant legislation, case law, theoretical principles and procedural rules, and (more explicitly addressing a link between theory and practice) to be able to apply this understanding in a specific situation.

In order to achieve these outcomes, they modified the 8-step PBL (ParaBL) model developed at the University of Manchester (see the list of Further Resources below). Modifications were necessary partly because only a limited amount of time was available for the whole investigation – only a single day in fact. In addition, they presented students with a package of reading materials, rather than expecting students to locate their own information. This package of materials included a range of practical and theoretical material, which was largely, but not entirely, relevant to the bail application. The day concluded with a written examination – drafting a formal bail application – lasting one hour. The modified 8-step process that they followed may be outlined as follows:

- Initial discussion (reading the problem in groups of no larger than four for 30 minutes, with clarification of any unknown terms)
- Definition of problem (15 minutes)
- Brainstorming and discussion of solutions (15 minutes each)
- Generating list of questions and resources to consult (15 minutes)
- Lecture, followed by private study (lasting 2 hours)
- Pooling discussion (30 minutes)

By contrast, EBL advocates a wider use of project work or research activity, emphasising the use of project work to master a given body of knowledge itself, and not simply to make connections within an existing body of knowledge. Toohey (1999) indicates that this kind of approach is a key factor that distinguishes an enquiry-based approach from a more traditional use of projects. This would suggest the use of project work, perhaps of a smaller scale, at earlier stages within the degree programme.

### **Advantages of Enquiry-Based Learning**

There is clearly significant overlap between these various approaches to EBL. Indeed, the synergy that results from this overlap is one of the main advantages of grouping these approaches to learning under the same umbrella term of EBL. Take, for instance, the example of Problem-Based Learning (PBL). The effectiveness of PBL within such domains as Medical Education and Nursing is now well established as indicated, for instance, within the meta-review by Albanese and Mitchell (1993). However, consideration of the underpinning ethos of PBL, as afforded by the focus on enquiry, facilitates its adaptation to a wider range of contexts.

It is further apparent that these enquiry-based approaches address the various issues that are currently of concern within higher education, and that were listed in Table 1. One might pick out the extent to which the modern 'knowledge economy' places a premium on the ability to create relevant knowledge that helps to solve specific problems, with open enquiries made possible by EBL allowing the developing of this ability. Or one could consider the way in which mass higher education has led to problems with student motivation – EBL places the onus on the student to direct their own enquiries. Ways in which EBL responds to these concerns are summarised in the third column of Table 1. The focus on enquiry highlights the main characteristic of a number of responses to these issues, thus providing a common way forward to develop student learning and providing significant scope for mutual support between academics and others involved in student learning.

EBL thus represents a shift away from more passive methods, which involve the transmission of knowledge to students, to more facilitative teaching methods through which students are expected to construct their own knowledge and understandings by engaging in supported processes of enquiry, often carried out in small groups. Indeed, we stress in this guide both the framework to support an enquiry and the social dimension to learning. EBL is thus situated within the broader

tradition of student-centred learning (see, for instance, Dewey 1938). This ensures that a wider evidence base is already in existence to substantiate the use of EBL, and indeed to support its further development.

## **Support for Enquiry-Based Learning**

In many ways, the challenge is to find effective ways to support students within this process so that the enquiry is able to yield effective outcomes. It is not enough to ask students to complete a finished product – the process needs to be supportive, as Edelson (1999, cited in Crabtree, 2004) recognises. Edelson picks out the need to address student motivation, accessibility of the tasks, level of background knowledge, ability to manage an enquiry and the resource constraints. In this, it is worth observing that the learning will primarily occur within parameters set by the tutor, even if it remains the students who determine how to proceed within these confines. The tutor will broadly determine such factors as the time available, the nature of any interactions with peers, and access to resources. In addition, the person facilitating the enquiry may find that they need to intervene to ensure that it remains relevant. It is therefore worth offering some observations as to how the tutor may establish an appropriate environment for learning.

### *Introduction to this approach to learning*

Given that this approach to learning differs from more traditional approaches it is, first of all, clear that student expectations will need to be addressed. Indeed, as one participant on the staff development programme noted, the way in which students are equipped to take on the challenges of EBL can be a crucial factor to its success:

- It may help to run a session in which students are introduced to the process and allowed to 'have a go'.
- Experienced students might be willing to model the process.
- Students can be provided with written or web-based information, guidelines, or reference material on EBL.
- If using student groups, allow time for them to 'gel'.
- Explain the role of the facilitator.

### *A clear, but open, starting point*

The starting point for an enquiry must be clearly stated, but sufficiently open to provide the basis for the enquiry – an open-ended task is central to the activity. This provides the freedom that is essential for any enquiry to take place. Problem-Based Learning employs triggers within the initial scenario, which may suggest relevant lines of enquiry. These triggers then provide a basis for the students themselves to set objectives for their learning on the problem. In general, the starting point and stimulus for learning can be an intriguing problem, an interesting case study or a 'real life' project. Such starting points, particularly when they are drawn from real life or the world of professional practice, often have the added value of being able to cross disciplinary boundaries, so the knowledge acquired as a result can be more eclectic than would have been the case on a more traditionally-taught course.

### *Resources to support learning*

All forms of EBL can utilise a variety of existing resources, appropriately timed to support students in their enquiries. These can include specific time-tabled sessions, such as interactive lectures and seminars, workshops, laboratories, fieldwork, resource sessions and peer-assisted study schemes. In PBL terminology, using these types of resources would be labelled a 'hybrid' method, a situation apparent in Case Study 1 above. However, resources that can be accessed more flexibly are also relevant, such as those that are held in a library or available via the internet or by using other technology. Given the wide range of resources that are now available within higher education, the scope for imaginative enquiries that are closely tailored to specific disciplines is increasingly evident.

### *Peer support*

EBL is ideally suited to collaborative student team-working. Operating co-operatively in small groups, with the sensitive guidance of a tutor/facilitator, students learn to take responsibility for specific lines of enquiry to facilitate the scope of research. Clearly, however, the extent to which the tutor facilitates the enquiry, and the size of the groups, can be varied according to the specific

circumstances. In Case Study 2 below, for instance, the support is largely provided by a partner, with the tutors only providing direct facilitation when requested. The pair of students then come together to pool resources, share research outcomes and decide the parameters of response to the task in the light of their diverse findings. In general, such meetings can either occur on a face-to-face basis, or alternatively can be mediated through the use of ICT. The presence in the group of a number of students will generate a diversity of potential responses to the material and a range of perspectives. The students will usually make decisions about what to include and how the findings will be presented – thus, in arriving at some point of closure, choice and creativity are within their ownership.

**Case Study 2: Learning a language through enquiries carried out in pairs (adapted from Morley and Truscott, 2004)**

In order to exploit the benefits of language learning in pairs (involving native speakers of two different languages), Morley and Truscott organised their two-semester course unit at the University of Manchester around a set of research tasks. Previously they had made use of more routine tasks, but after the course unit had operated for two years, the tutors found that the initial enthusiasm of the students had not been sustained over the second semester.

Each pair of students was asked to choose one research-based task from a set of four: a discourse analysis project, a translation project, a newspaper study, and a journal survey, with support for the enquiry largely coming from the peer, who is a native speaker of the language that their partner is seeking to learn.

- Tasks were designed so that students relied on their partner as a language resource and as a collaborator in the research process.
- Interaction with the partner was supported through an agreed schedule of work.
- There was a series of workshops and online discussion forums employing WebCT.
- Additional support was also available from the tutors.

The assessment of the course unit was in the form of a short report, completed with the partner's assistance – indeed students were required to complete a first draft of the report with corrections added by the partner. The report also included a piece of reflective writing, to enable the student to review their learning.

*Facilitation*

It is unrealistic to expect that students will never wander from the main thrust of an open-ended enquiry, and so facilitation will be important to bring them back on course. Otherwise, as Crabtree (2004) notes, students may find the tension resulting from the open-ended nature of the experience too challenging. Having set students off on a path of independent enquiry, the most unsettling experiences for a tutor, meanwhile, can be the change in role. The shift from content expert to facilitator may require as much, if not more, preparation as that given to the students.

When both students and tutor are adjusting to EBL methods together, there may be an initial period of 'learning to do it' where the facilitator needs to take a more active role in the process until an appropriate level of trust has been achieved. It is important that students feel they are free to explore a range of possible solutions to a given task, to take risks, to collaborate and exchange ideas freely with peers and with the facilitator.

Many facilitators appear to oscillate between being directive towards students and saying very little at all. The first creates student dependency: the latter results in students feeling that the lack of direction is duplicitous because they feel it is the facilitator's way of avoiding a declaration of their own agenda and concerns, as Savin-Baden (2003) notes. The balance appears to be a delicate one – too much tutor intervention and the EBL process is stifled, too little facilitation and the students may feel anxious or unsupported. In order to achieve this balance it is worth considering some of the responsibilities of the EBL facilitator:

- Asking open-ended questions that provoke further discussion and stimulate deeper exploration.
- Supporting students, motivating them to engage with the task and valuing their ideas and contributions.
- Encouraging students to reflect on their experiences.
- Monitoring progress and ensuring that students understand where they are in the process.

- Challenging student thinking, encouraging them to extend their boundaries and to seek new ways to work with problems and situations.
- Developing an atmosphere of trust in which students are willing to share and exchange ideas or work co-operatively.

The key to all the above points would appear to be the questioning techniques adopted by the facilitator. Sensitive and careful questioning can stimulate the generation of ideas, demonstrate support and interest in what students have to say, and will provide clues as to whether students are 'on track'. For instance, it is recognised in EBL that students sometimes prioritise ideas from their own experience at the expense of theoretical constructs; facilitation might then lead students to consider the relevance of theory in the given situation.

### **Assessment of Enquiry-Based Learning**

A further means to support student learning occurs through assessment – indeed assessment drives the learning experience, especially when the large majority of learning occurs outside of the classroom, a situation typical of EBL, as Gibbs (1999) notes. Assessment should thus facilitate the conduct of the enquiry, and also align with the achievement of the desired learning, as Biggs (1999) has emphasised.

It is evident that we must ensure that the assessment does, indeed, align with an enquiry and with the range of abilities that are being developed. Given the wide range of learning outcomes that are usually advanced during EBL, a range of assessment methods will usually be desirable, matching the complex open-ended nature of an enquiry. (An indication of the relevance to EBL of a range of assessment methods is provided in Table 2 below.)

It follows that evidence for assessment should, ideally, be generated as a natural product of the enquiry rather than as a separate exercise. For instance, evidence may naturally result from the structured group process – records of group meetings may serve both to sustain the group process and provide evidence for assessment. This is more desirable than to require evidence for assessment that is unrelated to the assessment, although it is still of course possible to employ more traditional methods such as a final unseen examination. However, an enquiry will lead to one or more outputs, and these, too, should form part of the assessment. Indeed, the nature of the products that are required from the process will significantly influence the learning that occurs during the process, as is evident in Case Study 3 below.

#### **Case study 3: Biological Sciences (adapted from Gunn and Raine, 2004)**

Enquiry-Based Learning formed the basis for a development in two separate undergraduate modules: a first year module in Human Physiology and a third year module in Parasitology at Liverpool John Moores University. In each case, the students were divided into small groups and were asked to choose a specific problem (each problem being stated in an open-ended fashion within one or two sentences) from a given list of 20. These problems addressed issues that had not been covered within the lecture-based element of the modules. The students were then required to give a group presentation on the topic.

In order to support this process, students were provided with a range of feedback, including comments from a tutor at the end of a group session, the opportunity for individual feedback, and an analysis of students' peer assessment.

Finally, it is worth noting that the assessment criteria will need to closely reflect the nature of the enquiry, as well as the characteristics of the specific method of assessment. In particular, the criteria will need to allow for the full range of lines of enquiry that support the achievement of the intended learning outcomes.

**Table 2. Selected types of assessment, as employed within Enquiry-Based Learning**

<b>Type of assessment</b>	<b>Connection with learning outcome</b>	<b>Comments</b>
Examinations	Only likely to be able to assess a limited range of the relevant learning outcomes.	Constraints from the context in which EBL is employed may necessitate the use of an examination, but scope is still present to tailor the examination to the enquiry that occurred, as in Case Study 1.
Group assessment	Directly addresses team-working skills. May either address the group process or a product created by the group as a whole.	Challenges are evident when marks are assigned to a group as a whole, but a variety of approaches are possible. See Bryan (2004).
Patchwork texts	Addresses reflective, synoptic abilities, as well as the ability to piece together an extended argument. These are key abilities for the conduct of an enquiry.	Patchwork texts require students to draw together specific formative assignments into a synoptic report for summative assessment. (See Winter, 2003.)
Peer assessment	Aligns with group-based processes, and allows students to understand marking criteria (and thus the criteria by which of the success of the enquiry will be judged).	Particularly effective when its use on a formative basis is required of the students. For an introduction, see Brew (1999).
Personal accounts	The ability to manage an enquiry is closely related to the ability to consider and evaluate its progress.	There are a variety of tasks that promote evaluation of one's own learning. See Moon (1999).
Portfolios	Evidence selected in order to demonstrate the required learning outcomes.	Open-ended nature of the portfolio allows students wide scope in selection of evidence, matching the nature of their enquiry. See Baume (2001).
Presentations	Given both time constraints and the reliance on group process, presentations (either oral or using a poster) are typically made by a group of students. This provides an effective means to assess team working skills as well as other outcomes.	See for instance Brown and Knight (1994).
Reports	A report on the enquiry as a whole (e.g. project report or dissertation) or on one or more aspects of the enquiry (e.g. feasibility study or research proposal) provides a straightforward way to assess its outcomes.	Care needs to be taken to ensure that the report serves to support the enquiry, rather becoming a separate task.

## Conclusion

We have outlined in this guide how learning that is driven by a process of enquiry can help to address current concerns and needs for student learning. The flexibility of the method allows for the development of a wide range of student abilities. It must be recognised, of course, that adopting EBL will usually involve significant adjustments for teachers and students. The flexibility of the method and adaptability to different disciplinary contexts, however, offers evident scope to effect the transition.

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## Further resources

### Resources on enquiry-based learning

<http://www.mcmaster.ca/cil/inquiry/inquiry.resources.htm>

A range of resources on processes of learning based on inquiry from McMaster University. (Includes case study material.)

### **Using the Internet to Promote Enquiry-based Learning**

<http://www.cotf.edu/ete/teacher/teacherout.html>

### **A Questioning Toolkit from FromNowOn.org**

<http://fromnowon.org/nov97/toolkit.html>

A comprehensive set of strategies for asking essential questions. Gives examples of the types of questions students can ask.

### **Grazing the Net: Raising a Generation of Free Range Students**

<http://fromnowon.org/grazing1.html>

A 'must read' article for those educators who are beginning to have students investigate problems using Internet research.

### **Framing Essential Questions**

<http://fromnowon.org/sept96/questions.html>

Looks at ways to frame questions that help students to engage in evaluation and that promote open-ended enquiries.

### **A framework for developing essential questions for student research.**

<http://www.fno.org/nov97/toolkit.html>

### **Problem-Based Learning**

<http://www.hss.coventry.ac.uk/pbl/>

Provides a wide range of links to other Problem-Based Learning Sites, including case study material.

### **The Boyer Commission on Educating Undergraduates in the Research University**

<http://naples.cc.sunysb.edu/Pres/boyer.nsf/>

Paper on undergraduate education in research universities within the US. Includes proposals on inquiry-based learning.

### **Managing your research project**

<http://www.lboro.ac.uk/service/sd/myrp/myrp-title.html>

Advice for students on the management of a research project.

### **A 'How-to-do it' guide to problem-based learning for students and tutors**

<http://www.parable.man.ac.uk/>

An guide to problem-based learning in 8-steps, developed at the University of Manchester.

### **Learning based on the process of enquiry**

<http://www.intranet.man.ac.uk/rsd/ci/eb/>

Resources developed during the LTSN Generic Centre-funded programme of staff development on EBL that helps to underpin this curriculum guide. (Includes case study material.)

### **Learning based on the process of enquiry: conference proceedings**

<http://www.intranet.man.ac.uk/rsd/ci/eb/cproceed.pdf>

Proceedings of the conference that completed the above staff development programme on EBL, including further case study material.