PROBLEM-BASED LEARNING EVALUATION TOOLKIT

Problem-based Learning

Special Interest Group

This Project has been funded by the Health Sciences and Practice Subject Centre of the Higher Education Academy (September 2009)

EDITORS:

Caroline Marcangelo, Senior Lecturer in Learning & Teaching Development, Centre for the Development of Learning & Teaching, University of Cumbria

Carolyn Gibbon, Principal Lecturer for Learning and Teaching, School of Nursing and Caring Sciences, University of Central Lancashire

Mark Cage, Research Officer, University of Brighton

CONTRIBUTORS:

Sharon Arkell, Senior Lecturer, University of Wolverhampton

Carol Cooper, Senior Lecturer, Sheffield Hallam University

Angela Darvill, Senior Lecturer, University of Salford

Angela Lee, Lecturer, University of Salford

Moira McLoughlin, Senior Lecturer, University of Salford

Gaynor Sadlo, Professor, University of Brighton

TECHNOLOGICAL SUPPORT

Elaine Tan, Learning Technologist, Centre for the Development of Learning & Teaching University of Cumbria

Glossary of Terms

Term	Definition
Assessment	Regarded as the development of learning through formative and/or summative feedback. Can also be where assessment itself is used as a means of learning
Collaborative learning	A group of individuals working and learning together
Community of Practitioners	A group of individuals working in a distinct area e.g. a clinical or academic setting
Curriculum design	Consideration of the development and the design of a curriculum which will either contain modules/units which either partially or wholly use PBL, or a curriculum that is wholly PBL
Evaluation	A wide-ranging term used to explain a systematic approach to the analysis of a given activity
Facilitation	Guiding and supporting students through their learning journey
Problem-based Learning	Where a query leads to learning through a distinct series of stages
Skills	Refers to a range of psychological, social and physical activities required in order to learn e.g. Key skills: used for everyday Transferable skills: used in a variety of different situations Lifelong skills: used in the continuing development of an individual
Student-centred	Where the individual takes ownership of their learning with the support and guidance of their facilitator(s)
Tools	Methods or instruments used to assist in the assessment and/or evaluation processes.

SECTION 1

BACKGROUND TO THE TOOLKIT

The Problem-Based Learning Special Interest Group (PBL SIG) was established in 2000 to share ideas and offer advice and guidance to others who were considering using PBL. There is a sustained belief that this method of facilitating student learning develops and promotes motivation, meaning and lifelong learning skills[1]. However, this belief has mainly been supported by anecdotal evidence and small-scale, evaluative studies which cannot be generalised. Published evaluation of PBL in the UK has been patchy and lacking coherence. Our recent focus has considered how PBL can be evaluated both meaningfully and systematically in order to deliver a high quality process, and ultimately strengthen the evidence base for future practice.

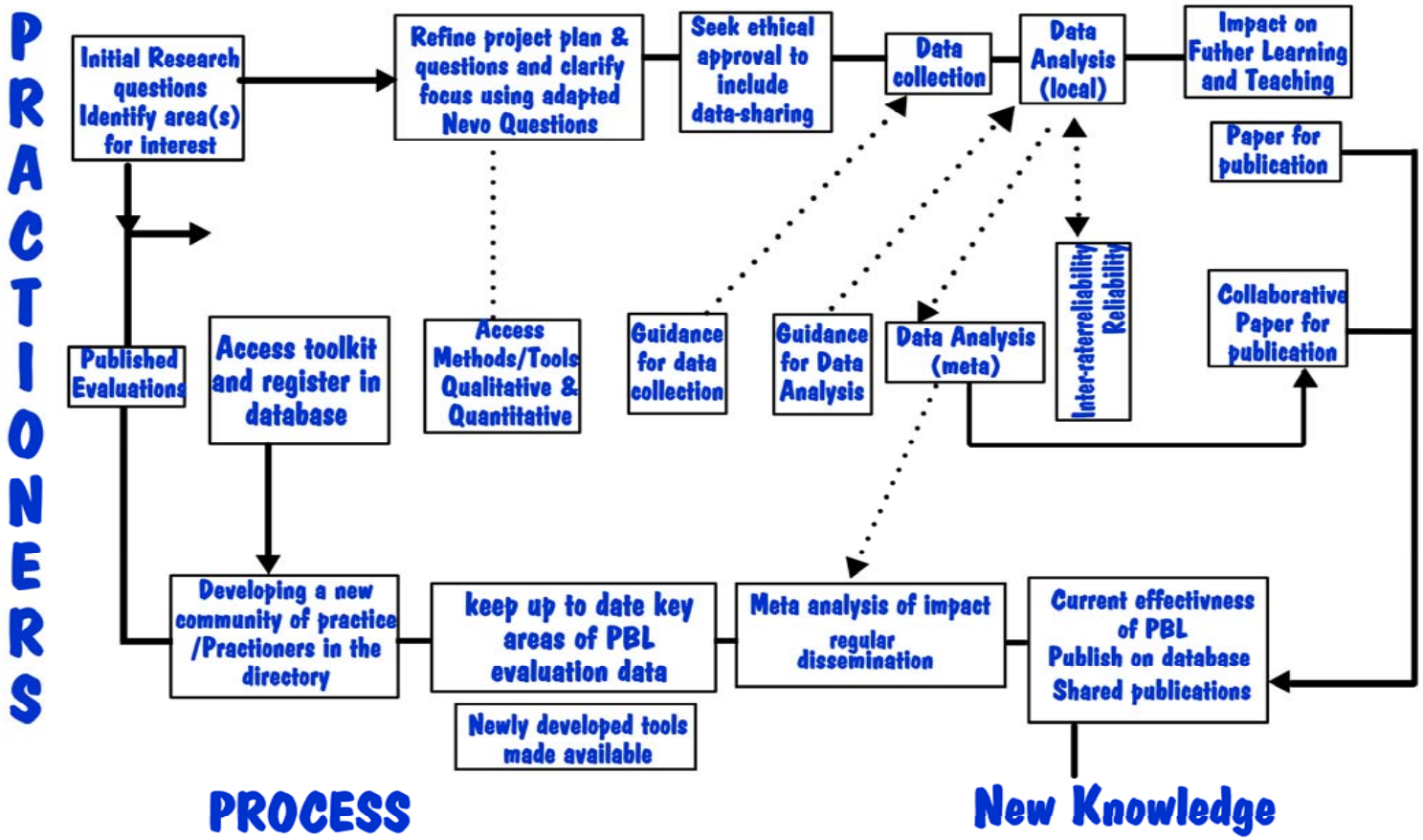
There are a huge range of factors which influence the development and delivery of PBL. These include: curriculum model/design, facilitators with varying skills and personalities, organisational issues (particularly logistics), educational policy from the institution and students' learning preferences. PBL does not provide an 'off-the-peg' system of teaching. However, there are growing numbers of higher education institutions (HEI's) using problem-based learning in the health sciences and practice subjects, and, by using the connections of the SIG across these; we have the ultimate aim of obtaining robust evidence through meta-analysis of what is effective practice in PBL.

PURPOSE OF THE TOOLKIT

The SIG-generated evaluation toolkit is designed as a source of agreed evaluative methods, tools and instruments that will enable the systematic generation of evidence from a broad range of Health Science and Practice (HS&P) related subject areas and programmes delivered within different HEI's across the UK. By using these agreed tools, the community of practitioners undertaking evaluations on a relatively small scale within their individual institutions can combine findings to build a more substantive database. This will increase our body of knowledge of PBL as a distinctive educational strategy, as well as its impact on learners and learning, thus enabling the development and enhancement of educational practice.

[1] Marcangelo C & Ginty A (2006) A Review of Evaluation Studies of PBL across disciplines, and the implications for our future practice: *presentation to the HE Academy Health Sciences & practice PBL Special Interest Group, 16/11/06*, Kings College London.

VISUAL REPRESENTATION OF HOW PBL EVALUATION TOOLKIT WILL BE USED



PRINCIPLES OF PBL ENDORSED BY SIG MEMBERS

PBL was popularised in the 1960's as a result of research by Barrows and Tamblyn[2] into the reasoning abilities of medical students. They argued that PBL was based upon two assumptions: the first being that learning through problem solving is much more effective than memory-based learning for creating a usable body of knowledge; the second, that medical skills, which are most important for treating patients, are *problem-solving* skills, not *memory* skills.

Biggs[3] considers PBL as "*not a method so much as a total approach to teaching, which could embody several teaching/learning activities and assessment methods …PBL reflects the way people learn in real life; they simply get on with solving the problems life puts before them with whatever resources are to hand*" (p231-2). Overall, there is agreement amongst enthusiasts that the approach is intended to facilitate collaborative learning and deep engagement with complex problems.

Problem-based learning starts with problems or situations rather than the exposition of knowledge. Students acquire knowledge and skills through a staged sequence of problems in context, together with associated learning materials and support from facilitative tutors[4]. In this way, it is fundamentally different from problem-solving learning, where the students are set a problem after they have been taught the knowledge conventionally[5].

One of the main objectives of PBL is to foster independent and life-long learners, who want to take a degree of responsibility for their own learning. They do so by formulating questions and learning needs in relation to a given problem. A PBL curriculum provides authentic experiences that foster active learning, support knowledge construction, and naturally integrate school learning and real life; this curriculum approach also satisfies state and national standards along with integrating disciplines.

The PBL SIG members active in this toolkit development have identified the following key areas that have a particular resonance with curriculum development and delivery:

- Curriculum design
- Facilitation of PBL
- Student experience of PBL
- Effectiveness of Learning incorporating assessment and outcomes

This is not an exhaustive list of significant components of PBL; however we would argue that they are fundamental to effective learning processes and outcomes.

[2] Barrows, H S and Tamblyn, R.M. (1980) *Problem-Based Learning: An Approach to Medical Education*. New York: Springer
[3] Biggs, J (2003) *Teaching for Quality Learning at University*, Buckingham: Open University Press
[4] Boud, D and Feletti, G (1997) *The Challenge of Problem-based Learning*, London: Kogan Page
[5] Savin-Baden, M (2000) *Problem-based Learning in Higher Education: Untold Stories*. Buckingham; Open University Press.

SECTION 2

EDUCATIONAL EVALUATION

Evaluating education has been the subject of debate for many years and has produced many scholarly texts and reports on why it should be carried out, when and by whom. There is no doubt that today's issues relating to standards and quality assurance are seen as a vital part of the overall delivery of education at many levels. However for the purposes of this toolkit the focus is on one particular aspect of education and that is the process and outcomes of PBL. The wide adoption of PBL across many disciplines has ensured considerable interest in this method. Yet the plethora of evaluation tools demonstrated in the literature can render the choice of appropriate ways of evaluating the various aspects of PBL confusing[6]. The aim of this toolkit is to clarify the evaluation process in relation to PBL, and to suggest particular methods and tools that may be most appropriate for collecting and analysing evaluation data.

PARAMETERS OF EDUCATIONAL EVALUATION

Guba and Lincoln[7] identify evaluation as a form of enquiry that seeks to determine the *merit* and *worth* of an evaluation or 'item' (in this case being the programme or process, for example). Merit judgements focus on the intrinsic quality of the 'item' being evaluated irrespective of the context or setting, whereas worth judgements focus on the usefulness or applicability of the 'item' in a defined setting or context. Maudsley[8] also subscribes to *worth* being the object of evaluation in her definition

> Evaluation refers to "a systematic process that judges the worth of an educational programme via quantitative and/or qualitative data analysis consistent with the evaluation question and aims to improve students' experience and achievements"

EVALUATION OF PROBLEM-BASED LEARNING

Evaluation studies can inform the community of practitioners as to the effectiveness of Problem – Based Learning (PBL) and support its development in current curricula as well as promoting its effective implementation into new and diverse programmes of study. A recent review of published evaluation studies by Marcangelo & Ginty[9] identified that they were mostly undertaken on a single iteration of a module, with a minority on an academic year or whole course; all occurred in single HEI's, with the focus mainly concerned with student opinions; and all used different methodology.

---

[6] Richardson, J.T E. (2005) Instruments for obtaining student feedback: a review of the literature. *Assessment & Evaluation in Higher Education* Vol.30, 4, pp.387-415

[7] Guba, E.G. & Lincoln, Y.S. (1989) *Fourth Generation Evaluation*. Newbury Park Ca, Sage

[8] Maudsley, G (2001) What issues are raised by evaluating problem-based undergraduate medical curricula? Making healthy connections across the literature.*Journal of Evaluation in Clinical Practice* 7:3, 311-324

[9] Marcangelo & Ginty, (2006) A Review of Evaluation Studies of PBL across disciplines, and the implications for our future practice: *presentation to the HE Academy Health Sciences & practice PBL Special Interest Group, 16/11/06*, Kings College London.

The members of the PBL SIG active in this toolkit development agreed that, as a body of academics drawn from a rich variety of HEI's across the UK, we had the opportunity to collaborate in more substantial evaluatory research *by using the same methods across a wide range of programmes.* As a result, we have developed an evaluation toolkit that can be used to collect comparable data that will lead to a greater collective understanding of what contributes to effective problem-based learning. We have selected a small range of evaluation 'tools' or instruments that have been used broadly across higher education, and include both qualitative and quantitative approaches.

THE STARTING POINT OF EVALUATION

Evaluation is crucial for both the maintenance of standards and in developing curricula. The literature pertaining to evaluation of educational methods identifies a number of dimensions which should be considered to assist in order to clarify the evaluative approach. We suggest the following questions should be answered by the evaluators prior to beginning any evaluation: (based upon Nevo's 10 dimensions of educational evaluation, 1986)

Dimension	Interpretation
How is evaluation defined?	*For example 'systematic evaluative research to inform, judge and improve';*
What are the functions of this evaluation?	*Be clear about the aim of the evaluation in relation to merit, worth, impact and significance: e.g. to inform future developments; to review the effectiveness of particular activities or 'trigger' problems*
What are the objects of evaluation?	*Areas for evaluation should also be clear, be this the programme design, student experience, the facilitation, the process and or outcomes of PBL in context*
What kinds of information that should be collected regarding each object?	*Both quantitative and qualitative data may be informative in ascertaining an understanding of process and outcome. Information may include effectiveness of knowledge acquisition; academic skill, subject –specific and core skill development; ethical awareness and/or attitude change; self-awareness and critical reflection, etc.*
What criteria should be used to judge the merit and worth of an evaluation object?	*Criteria may include efficient, effective and acceptable use of resources; achievement of explicit learning processes and outcomes; development of independent learners, able to work in teams, etc.*
Who should be served by an evaluation?	*Stakeholders may include yourself, students, other teachers within the team; the wider community of educators interested in PBL*
What is the process of doing an evaluation?	*Processes should include identification of area for evaluation, timing of the study, ethical methods and approval, undertaking the data collection, data analysis and dissemination of findings*
What methods of enquiry should be used in evaluation?	*The toolkit offers a selection of appropriate methods signalled from the particular areas for investigation: we suggest methods suited to particular areas of investigation*
Who should do evaluation?	*Will the evaluator be part of the delivery team or student body (insider research), or external to the people involved in the PBL. Recognise the potential impact of your choice on the responses*
By what standards should evaluation be judged?	*The standards will be the norms for educational research*

Box 1: 10 dimensions of education evaluation[10]

[10] Nevo, D (1986) *The Conceptualization of Educational Evaluation: An Analytical Review of the Literature,* pp15- 29 in House E.R, (Ed) (1986) *New Directions in Educational Evaluation*., Palmer Press, Lewes

SECTION 3

KEY AREAS FOR PBL EVALUATION:

CURRICULUM DESIGN

Evaluating a problem-based learning curriculum requires consideration of the philosophy underpinning the learning and teaching that takes place within its delivery. There has been a great deal of discussion as to the merits of employing a *whole course* philosophy, an *adapted* or '*hybrid'* approach for PBL, or at a modular level (as learning and teaching methodology). It is evident that each has advantages and disadvantages and each deserves to be evaluated in their own right. It is therefore useful to begin with an explicit course profile, describing specific characteristics that may be significant to your design, the learning process and the learning outcomes.

We recommend you include details such as:

- **course delivery mode** e.g. classroom-based, blended or distance learning
- **student attendance** e.g. full-time or part-time; work-based or campus-based
- **student profile** e.g. gender, age, disability, ethnicity, prior experience of learning
- **course or module subject area**
- **year of study and level of study** e.g. foundation, undergraduate and postgraduate
- **whole course, 'hybrid approach', or one module PBL**

Dangerfield et al[11] identify primary criteria for evaluating the curriculum as being acceptability, effectiveness and efficiency or sustainability:

- *acceptability* includes how students, academics and support staff respond to PBL in general as a learning method; this may be influenced by factors such as whether PBL is a whole course or hybrid approach, initial understanding and expectations, preparatory skills development and support provided in relation to PBL methodology, student acceptance of collaborative group work, and academic staff approaches to 'facilitation of learning' rather than 'teaching'.

- *effectiveness* relates to how successful the curriculum is in enabling the student to develop knowledge, skills and understanding. This may include how appropriate the aims, learning outcomes and overall guidance are in enabling the student to develop relevant knowledge, skills and understanding for the stage of the course; the appropriateness of scenarios/triggers for achieving this learning, how interesting and manageable the learning activities are, and the alignment of assessment methods to ascertain whether expected learning has been realised.

[11] Dangerfield, et al (2007) A whole system approach to PBL in Dental, Medical and Veterinary Sciences – a guide to important variables: http://www.campus.manchester.ac.uk/ceebl/resources/resourcepacks/pblsystemapproach_v1.pdf last accessed 8/9/09

- *efficiency* focuses on how cost-effective and therefore sustainable the curriculum is for students, academics and support staff in respective expenditure of time, effort, facilities and resources. This may include consideration of delivery in terms of its mode, and use of outcome measures such as cohort retention, achievement of course outcomes, indicators of lifelong learning, and comparison with similar non-PBL courses.

Additionally, you may wish to evaluate the overall module/course design in relation to underpinning PBL principles such as:

- does it facilitate learning that is *contextual*, *cumulative*, *integrated*, *active*, *collaborative* and *reflective*?

- does it offer both *group* and *individual* learning opportunities, and *formative* as well as *summative* assessment?

- does it facilitate the development of process skills that are both *generic* and *transferable* such as intellectual (academic study), affective (emotional intelligence) and social (communication) skills ?

- does it develop *subject-specific knowledge* and *skills*, and the ability to transfer and deepen subject knowledge through horizontal and vertical integration?

FACILITATION

Facilitation in education stems from the work of Rogers[12] [13] and Heron[14]. Rogers suggests that the qualities of an effective facilitator include the ability to be seen by students as genuine, accepting and prizing their contributions, but also being able to offer empathic understanding. In PBL, students learn through addressing problems and reflecting on their experience, and they work in small groups being guided by a facilitator. Therefore, the teacher, through facilitation, seeks to foster a safe, trusting climate in which the learner is motivated to hope for success. Thus the role of the facilitator is key to the success of PBL as a learning methodology.

Burrows[15] believes there should be genuine mutual respect between the students and facilitator and a partnership in learning should develop, which involves the facilitator as co-learner. However, this transition to the role of the facilitator of learning in PBL may not be easy for lecturers. Many have been used to more traditional 'transmissionist' approaches to teaching, and research exploring how to do this effectively is limited to research in centres where PBL has been used for a number of years, like Maastricht in Europe or McMaster in Canada. Tools for evaluating the role of facilitator in a PBL curriculum are scarce, and the available evidence limited to those identified in the systematic review grid.

PBL facilitation emphasises the importance of student-centred instead of teacher-centred education. Furthermore, Dolmans et al[16] argue that a tutor's performance is not a stable characteristic but is partly situation specific. It is considered by many that a facilitator of PBL should have some subject matter expertise but more importantly should know how to facilitate the learning process. Therefore, it is argued that, in evaluating facilitation,

[12] Rogers, C (1969) *Freedom to learn: a view of what education might become*. Columbus, OH: Charles E. Merrill
[13] Rogers, C (1983) *Freedom to learn for the 80s*. Columbus, OH: Charles E. Merrill
[14] Heron, J (1989) *The Facilitators' Handbook*. London: Kogan Page
[15] Burrows, D E (1997) Facilitation: a concept analysis, *Journal of Advanced Nursing*, 25, 396–404
[16] Dolmans DH, Gijselaers WH, Moust JH, de Grave WS, Wolfhagen IH, van der Vleuten CP (2002) Trends in research on the tutor in problem-based learning: conclusions and implications for educational practice and research. *Medical Teacher* 24(2):173-80

consideration needs to be given to both the development of the facilitator and the subsequent facilitation style.

Murray and Savin-Baden[17] offer a useful framework for PBL workshops to develop staff, whilst Johnston and Tinning[18] offer the notion of a group reflective practice strategy to support new (and not so new) facilitators. What is clear is that this is an area that requires attention. As Savin-Baden[19] states, there appears to be little written about educational development for facilitators. However, the development of tutors in becoming facilitators is key within PBL, and as can be seen below, the style adopted by an individual facilitator may make or break a group's ability to undertake PBL. Training appears to be haphazard and can depend on the depth of the wallet, but there is a unanimous agreement that some training is worthwhile. Ongoing support for facilitators also appears to be patchy and much will depend on the philosophy of the institution with regards to this area of staff development. Boud and Feletti[20] advocate support from the top from the outset of introducing PBL.

When evaluating facilitation approaches, consideration can be given to the various styles that individual facilitators apply to their facilitation. Wilkie[21] demonstrated through her research that at least four styles can be determined:

- *Liberating supporter*: seen by minimal intervention by the facilitator, with promotion of self-directed learning. The focus here was on content acquisition.
- *Directive conventionalist*: Facilitators in this category tended to retain control of both the material to be learned and how students were expected to learn.
- *Nurturing socializer*: Here the emphasis was on 'student-centredness'. The facilitator nurtures and supports the students attempting to socialise them into an ideal (defined by the facilitator) of a 'good' nurse.
- *Pragmatic enabler*: The facilitators in this group have developed their style through experience, recognising that one size does not fit all. These facilitators also recognise that the process of PBL is affected by external influences such as student characteristics, the nature of the problem, frame factors such as the assessment, and the amount of dialogue.

STUDENT EXPERIENCE

A student-centred approach to learning, such as PBL, logically necessitates the inclusion of research into student experiences and perceptions of this approach. A systematic search of the literature pertaining to this area uncovered a wealth of research. However it also became apparent that the terms *student experience* and *student perception* cover a myriad of differing issues. It clearly goes beyond *learning styles* and *approaches to learning*, but looks at the *experience of learning* as a whole. Defining the boundaries of these terms involves regarding the frame factors, as defined by Jacobsen[22]. Through a systematic literature review of articles, a number of frame factors, or sub-themes within *student experience* have been identified.

[17] Murray, I and Savin-Baden, M (2000) Staff Development in Problem-based Learning. *Teaching in Higher Education* 5:1, 107-126

[18] Johnston, AK and Tinning, RS (2001) Meeting the challenge of problem-based learning: developing the facilitators *Nurse Education Today* 21: 161-169

[19] Savin-Baden M (2003) *Facilitating Problem-Based Learning*. Maidenhead, Open University Press

[20] Boud D and& Feletti G (1997)(2nd ed) *The Challenge of Problem-Based Learning* London, Kogan Page

[21] Wikie, K (2004) Becoming Facilitative: Shifts in Lecturers' Approaches to Facilitating Problem-based Learning. In Savin-Baden, M and Wilkie, K *Challenging Research in Problem-based Learning.* Maidenhead, Open University Press

[22] Jacobsen, DY (2004) The Influence of Participants' Reception of Problem-based Learning on Problem-based Learning Tutorials. In Savin-Baden, M and Wilkie, K *Challenging Research in Problem-based Learning.* Maidenhead, Open University Press

- General Evaluation
- PBL vs Traditional Teaching
- Efficacy of the PBL course
- Student characteristics (including approaches to learning, gender, engagement, performance & preferences /attitudes)
- Group process (including effectiveness of group discussion/interaction)
- Tutor role (including teaching effectiveness/ quality & methods)

The majority of the research is aimed at evaluating the students' perceptions of one particular module/unit or course of study that has used PBL as a teaching and learning strategy. The **literature database** gives a more in-depth summary of all of the research reviewed by the authors and is intended as a précis of the research to enable the reader to select those articles that are of particular interest to them.

The studies demonstrated the wealth of research that is taking place throughout the world in a wide variety of differing subjects and disciplines. This review also revealed the breadth of differing approaches and tools used for this, making any meta-analysis impossible. The most widely utilised research tools were questionnaires, many of which were devised by the researchers themselves. Again, the quality of these varied in terms of reliability and validity. Focus groups were another popular research tool but again there are issues with the method, as researchers failed to identify how the sessions were conducted, making replication impossible.

We would like to recommend the following tools to potential researchers interested in contributing to the toolkit:

- *Course Experience Questionnaire* (CEQ) (Ramsden[23]). The CEQ examines student experiences on five scales: *good teaching, clear goals, appropriate workload, appropriate assessment,* and *generic skills*. This would provide an insight into learning issues related to the student experience.

- Qualitative methods such as *focus groups*. Focus groups provide participants with 'a relatively safe environment in which to share their experiences' leading to 'a relatively uninhibited discussion' (Barbour[24]). The interaction between group members in the focus group should lead to greater spontaneity and a greater depth of data than would be obtained from a questionnaire or structured interview. As Kitzinger[25] states it 'reaches the parts that other methods cannot reach' by allowing the researcher to examine not just *what* people think, but *how* and *why* they think that way.

EFFECTIVENESS OF LEARNING (incorporating assessment and outcomes)

Ramsden[26] suggests that, from the students' perspective, it is assessment as an extrinsic motivator which always defines the curriculum being studied. This indicates to students the most important aspects of the curriculum and also an indication of the workload. Additionally, Gibbs & Simpson[27] argue that the assessment itself is of greater influence

[23] Ramsden P (1991) A performance indicator of teaching quality in higher education: The Course Experience Questionnaire, *Studies in Higher Education*, 16 (2), 129-150
[24] Barbour, RS (2005) Making sense of focus groups, *Medical Education,* 39(7), 742-750
[25] Kitzinger, J (1995) Qualitative Research: Introducing focus groups *British Medical Journal*, 311, 299-302
[26] Ramsden P (2003*) Learning to Teach in Higher Education*. London: Routledge
[27] Gibbs, G and Simpson C (2004) Conditions under which assessment supports student learning. *Learning and Teaching in Higher Education,* 1 (1) pp3-31

than the teaching received. Biggs[28] terms this 'backwash' and suggests that the assessment should be aligned to the curriculum objectives so that the 'backwash' becomes positive rather than negative and deeper approaches to learning are encouraged.

Key learning objectives have been identified when using PBL[29] [30] [31] [32] [33]

- Applying a base of knowledge.
- Developing clinical reasoning and judgement, and decision making skills
- Fostering self-directed learning
- Promoting collaborative working
- Developing appropriate professional attitude

It is advocated that the use of a learning contract[34] may be of particular value in this situation. Such a contract provides a safe environment for students as its establishment involves the student(s) and facilitator(s) working in partnership. The contract will determine items such as the setting of ground rules; setting and agreeing objectives; allocation of tasks to group members; and agreeing outcome measures. A contract, whilst following the stages of PBL, will also assist both parties in checking their progress and also in determining the effectiveness of the group in achieving their learning objectives.

Perceived value of assessment as a learning tool

Earl[35] has identified three methods of learning through assessment: *assessment for*, *assessment of*, and *assessment as* learning.

- Assessment *for* learning is formative: through feedback the student is able to identify their current level of knowledge, understanding and skills to enable identification of additional learning needs.
- Assessment *of* learning is summative and is generally viewed as the traditional approach to assessment: it is used to allocate a grade to individual student work
- Assessment *as* learning is the learning achieved whilst undertaking the activities required when completing the assessment. A combination of formative and summative assessment is generally viewed as the more positive approach to assessment, and itself is a pertinent area for evaluation to ensure that the optimum balance is being achieved. This is equally so for group and individual assessment, where both collaborative skills and individual knowledge require appraisal.

There are many descriptions in the literature of the various efforts to assess the process and outcomes of PBL. However, it is difficult to find validated tools to evaluate the

[28] Biggs J (2003) *Teaching for Quality Learning at University*, Buckingham: Open University Press
[29] Painvin C, Neufeld V, Norman G, Walker I, Wheelan G (1979) The "triple jump" exercise - a structured measure of problem solving and self-directed learning. *Annual Conference on Research in Medical Education.* Conference Proceedings. Vol 18 pp 73-77
[30] Barrows H S (1986) A taxonomy of problem-based learning methods. *Medical Education*, vol 20 pp481-486
[31] Norman G R and Schmidt H G (1992) The psychological basis of problem-based learning; a review of the evidence. *Academic Medicine*, 73 (10) pp1068-1071
[32] Chaves J F, Baker M, Chaves J A, Fisher M L (2006) Self, peer, and tutor assessment of MSN competencies using the PBL-Evaluator. *Journal of Nursing Education*, 45 (1) pp25-31.
[33] Elizondo-Montemayor, L. L. (2004) Formative and summative assessment of the problem-based learning tutorial session Using a griterion-referenced system. *JIAMSE* vol14, 8-14
[34] Fry H, Ketteridge S, Marshall S (2003)(2nd ed) *A Handbook for Teaching and Learning in Higher Education*. London, Kogan Page
[35] Earl, LM (2003) *Assessment as Learning*. Thousand Oaks, California; Corwin Press.

assessment methods. This may occur because each particular PBL environment is unique and often utilises in-house assessment strategies (Major and Palmer[36]).

Chaves et al[37],[38] have developed a PBL assessment tool based on the principles of the *triple-jump exercise* to assess the five key objectives through ongoing assessment using student, peer and facilitator assessment. The use of this tool for assessing participants within PBL may be useful, as it incorporates the main elements of good practice within assessment.

SECTION 4

SIG-LED RESEARCH AND DATA SHARING

PURPOSE OF EVALUATIVE RESEARCH USING THIS TOOLKIT

This SIG-generated evaluation toolkit is designed as a source of agreed evaluative methods and instruments with the purpose of enabling the systematic generation of evidence relating to Problem-Based Learning. These instruments have been selected on the basis of their previous validated use within educational evaluation, and permission for use has been sought and received from the original authors. We have chosen two instruments for collecting quantitative data – the Course Evaluation Questionnaire and the Short Questionnaire to Evaluate the Effectiveness of Tutors in PBL – and two for obtaining qualitative data. There may be an opportunity in the future to use other validated instruments (or validating our own), however we do not intend to employ more than four (one per PBL theme) as this would contradict the original purpose of collecting comparable data.

By using these agreed tools, the community of practitioners undertaking evaluations on a relatively small scale within their individual institutions can combine comparable findings with others to build a more substantive database, with the ultimate aim of increasing our body of knowledge about PBL as a distinctive educational strategy and its impact on learners and learning.

ETHICAL CODE OF RESEARCH PRACTICE

In order to achieve the stated aim of this collaborative research there needs to be an acceptance of and agreement to adhere to agreed ethical standards of research. We have drawn these standards from the British Educational Research Association (BERA) Ethical Code and the American Educational Research Association (AERA). We recommend that these codes are followed when collecting data and this is essential if you are intending to share data with the community of practitioners.

BERA:
http://www.bera.ac.uk/ethics-and-educational-research/

[36] Major C H and Palmer B (2001). Assessing the effectiveness of problem-based learning in higher education: Lessons from the literature. *Academic Exchange Quarterly*, 5: (1

[37] Chaves J F, Baker M, Chaves J A, Fisher M L (2006) Self, peer, and tutor assessment of MSN competencies using the PBL-Evaluator. Journal of Nursing Education, 45 (1) pp25-31.

[38] Chaves J F, Chaves J A, Lantz M S (1998) The PBL-Evaluator: A web-based tool for assessment in tutorials. Journal of Dental Education, 62, (9), pg 671-674

AERA:
http://www.aera.net/uploadedFiles/About_AERA/Ethical_Standards/EthicalStandards.pdf

Comprehensive information can also be found in chapter 2 (pages 49-72) in Cohen, Manion and Morrison (2000)[39].

GUIDELINES FOR DATA COLLECTION

In order to provide an overview of surveys and focus groups Cohen, Manion and Morrison (2000) have been referred to, but it is acknowledged that there are equally useful texts.

SURVEYS: - are useful for gathering large scale data in order to make generalisations (Cohen, Manion & Morrison 2000:78). They are also useful for gathering context-free data. The purpose of a survey will be to collect opinions, scores, outcomes, conditions and ratings, and the key terms are measuring; testing; representativeness and generalisability. Surveys are usually carried out through questionnaires.
Further information can be found in chapter 8 of Cohen, Manion and Morrison (2000)

FOCUS GROUP: - are useful for group interviews. Morgan (1988 cited in Cohen, Manion and Morrison 2000) defines a focus group as being where the discussion is between the participants about a particular topic, rather than questioning between the interviewer and the group. It is important that participants are fully informed as to the nature of the discussion. Focus groups will be a useful way of collecting data related to PBL evaluation because the topic is focused, and the information gained can help to develop themes and subsequent interviews, if required.

Recommendations for running a focus group include:

- The number of focus groups. One may be insufficient as it will not be known if the outcome is unique to that group.
- 4-12 people (similar to a PBL group) is regarded as ideal, as too few can cause an imbalance in the group dynamics, and too large causes the group to be unwieldy and difficult to manage.
- Allow for non-attenders, so over-recruit.
- Take care with the sampling, so that each person carries a particular characteristic.
- Ensure all take part, have something to say and are comfortable saying it.
- Chair the meeting (act as facilitator) so that the meeting is open-ended but to the point (Morgan 1988 cited in Cohen, Manion & Morrison 2000).
- The use of a second 'follow up' focus group in order to probe deeper into emergent themes.
- An 'independent' facilitator where participants may be affected by relationship with the researcher.
- A co-facilitator to take notes.
- The establishment of ground rules prior to the session.

GUIDELINES FOR DATA ANALYSIS

For analysis of data, we recommend that you use, if possible, appropriate software packages to assist you in handling the data. For example:

- Quantitative – SPSS

[39] Cohen,L, Manion, L & Morrison, K (2000) *Research Methods in Education*. London, Routledge Falmer

- Qualitative – Nvivo

Seek local guidance for using these packages, or consult online tutorials.

PERMISSION FOR DATA-SHARING

One of the fundamental reasons for developing this toolkit was to enable the community of PBL practitioners to share comparable data collected from different areas. This may be different geographical, professional, institutional or subject specific areas. Many individual researchers are only able to study their own student groups with the result that each piece of research is relatively small scale. By sharing data collected using the same tools and collection methods, it is anticipated that we will develop a growing bank of data worthy of a larger scale analysis and therefore generate evidence-driven knowledge related to the effectiveness of PBL.

When seeking ethical approval in order to carry out the research, we recommend that you include data sharing within your research proposal.

As a community of practitioners there is also the possibility for collaborating across boundaries in all sections of the research process. This may include requesting a peer from the community to review the data analysis for inter-rater reliability.

QUANTITATIVE TOOLS

The Course Experience Questionnaire (CEQ)

The Course Experience Questionnaire (***CEQ***)[40] is a development of work originally carried out at Lancaster University in the 1980s. It is used as a measure of perceived teaching quality in degree programmes in national annual surveys of all graduates in the Australian higher education system and is increasingly being employed as a measure of the quality of teaching in universities in the UK. It was designed as a performance indicator (PI) of teaching effectiveness, at the level of whole course or degree, in higher education institutions. The ***CEQ*** is based on a theory of university teaching and learning in which students' perceptions of curriculum, instruction and assessment are regarded as key determinants of their approaches to learning and the quality of their learning outcomes (Marton & Saljo[41], Entwistle & Ramsden[42], Ramsden[43]). Three versions - CEQ 36 items, CEQ 30 items (a in table), and CEQ 23 (b in table) – are available.

The instrument was designed to measure differences in the quality of teaching between comparable academic organisational units in those important aspects of teaching about which students have direct experience and are therefore validly able to comment (viz. quality of teaching, clear goals and standards, workload, assessment, emphasis on independence).

Permalink:
http://search.ebscohost.com/login.aspx?direct=true&db=tfh&AN=9704294707&site=ehost-live[44]

[40] Ramsden P (1991) A performance indicator of teaching quality in higher education: The Course Experience Questionnaire, *Studies in Higher Education*, 16 (2), 129-150
[41] Marton, F and Saljo,R (1976) On qualitative differences in learning II-outcome as a function of the learner's conception of the task. *British Journal of Educational Psychology*. 46, 115-127
[42] Entwistle and Ramsden (1982) *Understanding Student Learning*. Beckenham, Kent: Croom Helm
[43] Ramsden P (1992*) Learning to Teach in Higher Education*. London: Routledge
[44] Wilson, Kethio. L., & Lizzio, Alf, (1997) The development, validation and application of the Course Experience Questionnaire. *Studies in Higher Education* Mar97, Vol. 22, Issue 1

The Course Experience Questionnaire (CEQ 36, CEQ 30 & CEQ 23) Instructions

In answering this questionnaire, please think about the course as a whole rather than identifying individual subjects, topics or lecturers. The questions relate to general issues about your course, based on comments that students have often made about their experiences of university teaching and studying. Your responses are strictly confidential and will not be seen by teaching staff.

Items are scored on a scale from 1 to 5; where 1 means 'definitely disagree' and 5 means 'definitely agree', save for those printed in italics, which are scored in the opposite direction.

Key: **GT**= Good Teaching scale; **AA** = Appropriate Assessment scale; **CG** = Clear Goals and Standards scale; **GS** = Generic Skills scale; **AW** = Appropriate Workload scale; **IN** = Emphasis on Independence scale; **OS** = overall satisfaction item

Items

CEQ version	Question	1	2	3	4	5	category
[b]	1 It's always easy here to know the standard of work expected						CG
[b]	2 This course has helped me to develop my problem-solving skills						GS
	3 There are few opportunities to choose the particular areas you want to study						IN
[a,b]	4 The teaching staff of this course motivate students to do their best work						GT
[a,b]	5 The workload is too heavy						AW
[b]	6 This course has sharpened my analytic skills						GS
[a]	7 Lecturers here frequently give the impression they have nothing to learn from students						AA
[a,b]	8. To do well in this course all you really needed was a good memory						AA
[a,b]	9 Staff here put a lot of time into commenting on students' work						GT
[a,b]	10 As a result of my course, I feel confident about tackling unfamiliar problems						GS
[b]	11 This course has helped develop my ability to work as a team member						GS
[b]	12 As a result of doing this course, 1 feel more confident about tackling unfamiliar problems						GS
[b]	13 This course has improved my written communication skills						GS
[a]	14 It seems to me that the syllabus tries to cover too many topics						AW
[a]	15 The course has encouraged me to develop my own academic interests as far as possible						IN
[a]	16 Students have a great deal						IN

	of choice over how they are going to learn in this course						
[a,b]	17 Staff seem more interested in testing what you've memorised than what you've understood						AA
[a,b]	18 My lecturers were extremely good at explaining things						GT
[a,b]	19 Too many staff asked me questions just about facts						AA
[a,b]	20 The staff make a real effort to understand difficulties students may be having with their work						GT
[a]	21 Students here are given a lot of choice in the work they have to do						IN
[a,b]	22 Teaching staff here normally give helpful feedback on how you are going						GT
[a,b]	23 Our lecturers are extremely good at explaining things to us						GT
[a]	24 The aims and objectives of this course are NOT made very clear						CG
[a,b]	25 Overall, I was satisfied with the quality of this course						OS
[a,b]	26 Too many staff ask us questions just about facts						AA
[a,b]	27 There's a lot of pressure on you as a student here						AW
[b]	28 This course has helped me develop the ability to plan my own work						GS
[a]	29 Feedback on student work is usually provided ONLY in the form of marks and grades						AA
[a]	30 We often discuss with our lecturers or tutors how we are going to learn in this course						IN
[a]	31 Staff here show no real interest in what students have to say						GT
[a]	32 It would be possible to get through this course just by working hard around exam times						AA
[a]	33 This course really tries to get the best out of all its students						GT
[a]	34 There's very little choice in this course in the ways you are assessed						IN
[a,b]	35 The staff here make it clear right from the start what they expect from students						CG
[a,b]	36 The sheer volume of work to be got through in this course means you can't comprehend it all thoroughly						AW
	37 Overall, I am satisfied with the quality of this course						

A short questionnaire to evaluate the effectiveness of tutors in PBL

Permission from Diana Dolmans (e-mail D.Dolmans@EDUC.unimaas.nl) received 09/10/08

Yes of course you are permitted to promote the questionnaire. But, if data is collected with the questionnaire and/or the data will be used for research purposes (e.g. publications) it should be clear to the users that they need to refer to the original source, and when someone wants to download the questionnaire it should be clear that this has been developed by the authors stated and the sources should be mentioned[45]

I have another questionnaire that can be used to evaluate tutors in PBL. This questionnaire has been validated and has also been implemented in several PBL curricula. I started earlier with a longer version of this questionnaire and published about it in Higher Education in 2003[46]

Later on I developed and validated a shorter questionnaire in Medical Teacher in 2005. This questionnaire is used in Maastricht for several years now within the medical school[47]

The questionnaire developed earlier by Dolmans et al. was based on theoretical notions underlying contemporary constructivist approaches to learning and instruction on which problem-based learning is based. The common principles utilized by constructivists include active or constructive learning, self-directed learning, contextual learning and collaborative learning. In addition, modern theories on teaching stress that the teacher's intra-personal behaviour is important. The instrument developed was based on these insights and included items on the five main topics mentioned: active/constructive, self-directed, contextual and collaborative learning and intra-personal behaviour[48].

[45] Dolmans, D and Schmidt, HG (1994). What Drives the Student in Problem-based Learning? *Medical Education*, 28, 5, 372-380. http://publishing.eur.nl/ir/repub/asset/2703/eur_schmidt_100.pdf

[46] Dolmans, DHJM, Wolfhagen, HAP, Scherpbier, AJJA and Vleuten, van der, CPM (2003). Development of an instrument to evaluate the effectiveness of teachers in guiding small groups. *Higher Education,* 46, 431-446

[47] Dolmans D and Ginns P (2005) A short questionnaire to evaluate the effectiveness of tutors in PBL: validity and reliability. *Medical Teacher*, 27,6, 534-538. http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=18406032&site=ehost-live

[48] Dolmans, D and Schmidt, HG (1994) What Drives the Student in Problem-based Learning? *Medical Education*, 28, 5, 372-380. http://publishing.eur.nl/ir/repub/asset/2703/eur_schmidt_100.pdf

Students are asked to indicate on a 5-point Likert scale whether they totally disagree (1), disagree (4) are neutral (3) agree (4) or totally agree (5) whilst considering their learning activities for the past year.

Table 1. The items of the questionnaire and the corresponding themes

Theme 1: Influence of the discussion in the tutorial group

(1) The discussion in the tutorial group determines to a large extent what I will study
(2) The tutorial group discussion is an important stimulus for my learning activities during self-study
(3) The learning issues generated are the most important starting point for my learning activities during self-study
(4) I study to a large extent independently from the learning issues generated

Theme 2: Influence of content tested

(5) I take a look at the questions included in the tests to get an idea of how deeply I should study particular subject-matter
(6) The questions that are included in the tests to a large extent determine what I will study
(7) The closer the date the test will be administered to us, the more time I spend on test preparation
(8) The closer the date the test will be administered to us, the less time I spend on studying the learning issues generated in the tutorial group
(9) I do not spend any time on studying particular issues, if I am convinced that these issues will not be tested
(10) The learning issues generated in the tutorial group are tuned to the subject matter expected to be tested

Theme 3: Influence of the course objectives

(11) At the start of a course, I consult the course objectives stated in the course book
(12) At the end of the course, I consult the course objectives to check whether I covered all the subject matter I was expected to cover
(13) During the course, the course objectives influence what kind of learning activities I will conduct

Theme 4: Influence of lectures

(14) Topics covered during lectures influence which topics I select for self-study
(15) Lectures are an important source of information to decide which topics I will study more extensively

Theme 5: Influence of the tutor

(16) In general, tutors stimulate my learning activities
(17) In general, tutors stimulate students to make use of different sources of information
(18) In general, tutors have an important influence on the selection of learning issues

Theme 6: Influence of reference literature

(19) I usually confine myself to the reference literature cited in the course book when searching for relevant literature
(20) I hardly review literature beyond the sources that are included in the course book

Short tutor evaluation questionnaire[49]

Please indicate the closest response to the statement:
1= strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

	Question	1	2	3	4	5
	Constructive/active learning: the tutor stimulated us . . .					
1	to summarize what we had learnt in our own words					
2	to search for links between issues discussed in the tutorial group					
3	to understand underlying mechanisms/theories					
	Self-directed learning: The tutor stimulated us . . .					
4	to generate clear learning issues by ourselves					
5	to search for various resources by ourselves					
	Contextual learning: the tutor stimulated us . . .					
6	to apply knowledge to the discussed problem					
7	to apply knowledge to other situations/problems					
	Collaborative learning: the tutor stimulated us . . .					
8	to give constructive feedback about our group work					
9	to evaluate group co-operation regularly					
	Intra-personal behaviour as tutor:					
10	The tutor had a clear picture about his strengths/weaknesses as a tutor					
11	The tutor was clearly motivated to fulfil its role as a tutor					

Global score

12. Give a grade (1–10) for the overall performance of the tutor
(6 being sufficient, 10 being excellent) 1 2 3 4 5 6 7 8 9 10

Absence/replacement

13. How often was your own tutor absent? 0 1 2 3 4 5 6>
14. How often did your tutor take care of replacement when being absent? 0 1 2 3 4 5 6>

Open question

15. Give the tutor tips for improvement (formulate shortly). Do this especially if you gave your tutor a score below six.

[49] Dolmans D and Ginns P. (2005) A short questionnaire to evaluate the effectiveness of tutors in PBL: validity and reliability. *Medical Teacher*, 27,6, 534-538

QUALITATIVE METHODS

Focus Group Interview Questions

As part of your focus group interviews with students and tutor/facilitators, we would request you insert these questions in with your own chosen questions. This will enable us to gather data from the shared questions that can be collected to gain stronger comparative evidence.

(Please refer to data collection methods earlier in this section regarding Focus Group Interview methodology to ensure the data will be comparable)

Questions related to CURRICULUM DESIGN

How have you found the overall design of the course/module?

Describe what helped most in preparing you for using a PBL approach?

How does this type of course/module design motivate you to learn (or not)?

How does PBL compare to other forms of learning you have experienced?

In what ways, if any, has PBL changed your view of learning?

In what ways has PBL prepared you for your chosen professional practice?

Questions related to FACILITATION (may follow up from Dolman's questionnaire)

How has the facilitator helped to support your individual learning?

How has the facilitator influenced your group learning activities?

How does the style used by the facilitator affect what you learn?

How has the feedback from the facilitator influenced your learning?

What did the facilitator do that was most helpful?

Did you find any aspects of the facilitation unhelpful to group learning?

Questions related to STUDENT EXPERIENCE

Describe your first experiences of PBL

Describe your positive experiences of PBL and why you found them so

Describe the experiences of PBL you found difficult or unhelpful

How does PBL compare to other forms of teaching you have experienced

In what ways, if any, has PBL changed your view of learning?

In what ways has PBL prepared you for your chosen professional practice?

Questions related to ASSESSMENT AND ACHIEVEMENTS

In what ways has PBL helped to prepare you for your course/module assessments?

What do you believe you have learnt as a result of this PBL?

Has the assessment influenced what / how you have approached PBL?

Do you think the assessment has let you demonstrate fully what you have learnt?

SYSTEMATIC APPROACH TO SELECTION OF EVALUATION METHODS & TOOLS

In developing this toolkit we acknowledge that research into the development of evaluation tools and the process of educational evaluation has been widely undertaken by others. In order to systematically review available papers relating to this research the following parameters of the literature were identified, in keeping with the EPPI centre methods (ref):

- Written in English; Worldwide origins
- Health Care focused (initially)
- Databases searched: Ingenta; Ovid (Medline, Cinahl); RIC; EBSCO; + Snowballing technique
- Dated 1997 onwards

The literature review used the following key words:

PBL + Evaluation methods *+ facilitation;*
+ tutor styles/teaching styles;
+ assessment
+ evaluation
+ learning
+ student experience
+ student feedback
+ student perceptions
+ key skills/core skills/transferable skills/lifelong skills

The literature search using these parameters and key words has been summarised into a grid that identifies the following areas:

· Author
· Date
· Tools used in the evaluation and whether they are presented in the paper Evaluation tool used for PBL specifically or for general pedagogical evaluation
· Brief notes about the tool used
· Focus of the evaluation
· Scope – length and/or size of curriculum section to which study pertains
· Student stage of professional study (e.g. pre/post qualification)
· Profession undertaking PBL
· Country of study
· Method
· Number participants
· Qualitative/Quantitative
· Data analysis
· Findings and weight of evidence

This table is located within the web version of the toolkit to enable the possibility of access through direct links to the papers:

http://feedback.bton.ac.uk/pbl/pbldirectory/toolkit/HEAToolkitHome.php

FOR YOUR NOTES: