

Enquiry-Based Learning: perspectives on practice

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Traditional lecture-based teaching methods are being replaced or supplemented by approaches which call for reframing the roles and identities of teachers and learners. Enquiry-Based Learning (EBL) is one such approach. This paper reports on a study investigating the perceptions of staff and students ($N = 25$) involved in an EBL capacity building project in the north-west of England. Q methodology was used to investigate the subjectivities of the participants. The findings are discussed using sociocultural learning concepts relating to activity theory and communities of practice. The paper concludes that EBL may improve the quality of teaching and learning in higher education, but careful consideration should be given to the dynamics of the specific context in which it is introduced.

Keywords: teaching methods; problem-based learning; activity theory; communities of practice; Q methodology; subjectivity

Introduction: Enquiry-Based Learning (EBL) and Problem-Based Learning (PBL)

Enquiry-Based Learning (EBL) is used as an umbrella term by the Higher Education Academy (2007a) to cover forms of learning driven by a process of enquiry, including the more widely known approach of Problem-Based Learning (PBL). The evolution of PBL as a particular approach to teaching and learning in higher education can be traced back to the development of medical education programs in Canada (Barrows 1986; Barrows and Tamblyn 1980). Barrows and Tamblyn (1980, 1) define PBL as ‘the learning that results from the process of working toward the understanding or resolution of a problem.’ Gilkison (2004) notes the spread of PBL beyond Canada to other countries and disciplines. Interest in EBL has been stimulated recently in the UK through the HE Academy’s (2007b) Fund for the Development of Teaching and Learning, and the establishment of an EBL-related Centre for Excellence in Teaching and Learning (CEEEL 2007).

Mantzoukas (2007, 245) comments that EBL and PBL ‘share the same philosophical orientations and educational intentions.’ EBL/PBL approaches typically involve engagement with a complex problem or scenario in which the students are able to direct both the lines of enquiry and to choose the methods employed. Regarding the learning outcomes of EBL/PBL modules, Mantzoukas (2007, 247) comments that these ‘need to be predetermined by the curriculum just as was the case with traditional models of teaching.’ In EBL/PBL, however, the learning process is more student-centred (Evenson and Hmelo 2000), and problems drive the learning (Ladyshevsky and Edwards 1999). Price (2003, 57) outlines five

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stages which shape the EBL process: creating enquiry focus; shaping the enquiry; gathering and evaluating information; refining understanding; reaching closure. de Graaff and Kolmos (2003, 657) comment that PBL is used to describe ‘an amazing diversity of educational practices’; Savin-Baden (2000, 123) outlines five conceptual models of PBL, while Kaufman (1998) includes small-group tutorials, problem-based lectures, large-group case method discussion, and problem-based laboratories among the various formats used.

Various claims have been made for EBL by proponents, including its applicability to different learning environments, advantages over traditional teaching methods, suitability for developing thinking and transferable skills, relevance to lifelong learning and suitability for meeting the requirements of industry (e.g. Hutchings and O’Rourke 2004; Oliver and McLoughlin 1999). However, there have also been caveats. For example, de Graaff and Kolmos (2003, 657) suggest that there is ‘a considerable lack of clarity regarding the concept of problem-based learning.’ Other commentators (e.g. Miflin 2004) have suggested that sometimes Barrows’ original model has been misunderstood and adapted too freely and uncritically.

Enquiry-Based Learning (EBL): a capacity building project

The present study was undertaken as an integral part of an EBL capacity building project which was funded and supported by the Learning and Teaching Support Network Generic Centre (now HE Academy). It involved a total of approximately 50 staff from eight higher education institutions, drawn from a wide range of subject areas. Each project participant belonged to a small project group, led by a facilitator. A development program for the project participants involved five days of training on EBL, with sessions covering areas such as student research, PBL, fostering creativity, departmental strategies to support EBL, and the scholarship of teaching. The participating staff used the training to engage students with EBL in their respective institutions. The students’ learning included PBL, small-scale fieldwork investigations and case studies adapted to various disciplinary contexts, projects and research activities. These activities were employed at a range of scales, from a single element of a module to a strand across an entire program.

The conceptual framework for the present study treated teaching and learning as activity that is socially situated (Engeström 1999) and explored the perspectives of the study participants in relation to their communities of practice (Wenger 1998). Guile and Young (1998, 185) comment that both Engeström and Wenger regard learning as a fundamentally social and reflexive process. Roth and Lee (2006, 27) note that the concept of ‘communities of practice’ originates from ‘a cultural–historical theory of activity, or, as Lev Vygotsky called it, in a “concrete human (social) psychology.”’ The study findings are discussed below using an activity theory framework, which is grounded in the notion that human beings use tools to work on an object, or problem space, in order to achieve a desired outcome (Engeström 1993). The motive of a collective activity system, according to Engeström (2000, 964), is ‘embedded in the object of the activity.’ Accordingly, in Figure 1 below, the university is shown as a *subject* which uses EBL as an educational *tool* to work on the *object*, i.e. the learners, with the intended *outcome* being the learners’ development within and beyond the university activity system. This object-oriented activity, in

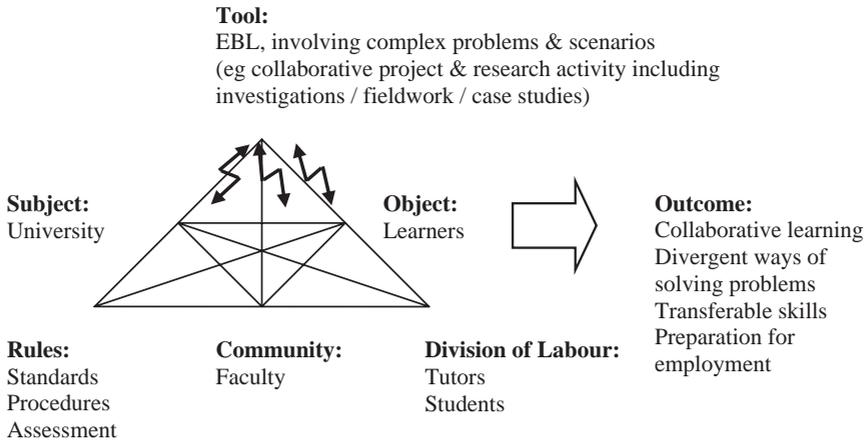


Figure 1. Object-oriented activity, with contradictions in the activity system (after Engeström 1999, 31).

whichever institution it occurs, involves a *community* with *rules* and a *division of labour* among the various participants.

Engeström (1999) emphasises the importance of analyzing internal contradictions within an activity system. Kangasojä (2002, 200) describes such contradictions as, ‘the driving force of development. They are manifest in the daily practices as breakdowns, tensions, ruptures and innovations. They call for reworking, both conceptually and very concretely, the objects and motives that sustain the activity, and for re-mediating the activity system by way of improving and inventing new tools.’ Engeström (1999, 32) notes that actions involve ‘failures, disruptions and unexpected innovations,’ and recommends analyzing the entire activity system in order to ‘illuminate the underlying contradictions that give rise to those failures and innovations as if “behind the backs” of the conscious actors.’ Possible contradictions between EBL as a *tool* and other elements of the activity system are suggested by the ‘lightning bolts’ in Figure 1 above. These are discussed later in the paper with regard to the Q methodology data and the literature on EBL.

Methodology

As described by Brown (1980, 5), ‘Q technique and its methodology . . . was designed to assist in the orderly examination of human subjectivity,’ and was chosen for the present study as it offered a theoretical basis for understanding the diversity of views on EBL held by staff and students. Brown (1997, 14) describes the purpose of Q as being, ‘to enable the person to represent his or her vantage point . . . for inspection and comparison.’ In Q methodology, the study participants represent their viewpoints by rank ordering (or ‘sorting’) a set of items (or ‘Q-sample’). A concourse of diverse views on EBL was developed from a range of sources including the academic literature and interviews with individuals from a range of backgrounds with personal experience of EBL provision. From this concourse, a Q-sample comprising 48 statements (see Appendix 1) was developed. McKeown and Thomas (1988, 17) emphasise the fact that, in Q methodology, ‘variables are the people

- 3	- 2	- 1	0	+ 1	+ 2	+ 3
Strongly Disagree	Moderately Disagree	Mildly Disagree	Neutral	Mildly Agree	Moderately Agree	Strongly Agree
4 statements	6 statements	9 statements	10 statements	9 statements	6 statements	4 statements

Figure 2. Distribution of the statements in the Q-sorts.

performing the Q-sorts, not Q-sample statements.’ Likewise, Brown (1980, 6) notes that, ‘the resultant factors point to categories of operant subjectivity . . . to persons bearing family resemblances in terms of subjectively shared viewpoints.’ Following a call for participants, 16 of the approximately 50 staff in the EBL capacity building project agreed to take part. Students who had experienced EBL were also approached by the staff and nine agreed to participate. The 25 participants were asked to sort the statements under seven headings, following a quasi-normal distribution as shown in Figure 2 below. The individual Q-sorts, i.e. the unique distribution of the statements by each participant, provided the unit of data for subsequent analysis. PQ Method, a dedicated Q methodology software package, was used for correlational and factor analyses.

With regard to the ratio of Q-sorts to statements, Brown (1996) comments that ‘the ultimate test of a factor in Q is not the number of statements, but whether the Q sorts (hence the factors which they produce) are schematical, i.e. whether each Q sort makes sense and is homologous with what the person wants to say. The key, as Stephenson has pointed out, is in the diversity of the concourse and in the Q sample which models it.’ After sorting the statements, participants were asked to comment on their Q-sort, particularly in relation to the items with which they agreed strongly or disagreed strongly. These comments would be used later to exemplify the viewpoints associated with each of the identified factors.

Results

Principal Components Analysis revealed five factors with an eigenvalue greater than 1.00; this figure was used as a heuristic to guide the selection of factors for rotation (Donner 2001, 32; Thomas and Watson 2002, 143). The five factors were rotated using Varimax (see Table 1 below), which Brown (1980, 238) notes may be used if researchers wish to avoid imposing a priori categories on the data.

Following Brown (1980, 262), the associated factor arrays (see Appendix 1, Table A1) were, ‘placed side by side and compared, the differences and similarities in scores providing the bases for description and theorizing.’ The viewpoints thus interpreted are described below. Note: Q-sample statement numbers are referenced in brackets, e.g. (2).

Areas of consensus among the five viewpoints

All five factors, or viewpoints, believe that EBL can improve the quality of teaching and learning (2). They believe that most students are interested in new ways of learning, providing the lecturer encourages their initial interest (7). They feel that it is part of a tutor’s job to try to make learning interesting (39). They feel that students’ learning styles are significant (10) in the teaching and learning process and that EBL

Table 1. Factor matrix showing the factor loadings of the 25 participants (with an X indicating a defining Q-sort).

Q-Sort	Subject	F1	F2	F3	F4	F5
1	T01 Medicine	0.5903	0.2860	0.1783	0.4397	0.3264
2	T02 Science	0.1955	0.0274	0.8283X	0.0852	0.1222
3	T03 Languages	0.3606	0.3092	0.4021	0.4923	0.2235
4	T04 Public Health	-0.0573	0.3329	0.1388	0.4580	0.6559X
5	T05 Languages	0.4120	0.1503	-0.0378	0.7117X	0.1928
6	T06 Education	0.3993	0.4019	0.1188	0.5913X	0.0865
7	T07 Management	0.3570	0.0376	0.1807	0.7012X	0.2562
8	T08 Engineering	0.3543	0.0502	0.3114	0.0482	0.7498X
9	T09 Computation	0.2590	0.3115	0.1460	0.2976	0.6572X
10	T10 Languages	0.1037	0.7986X	0.0324	0.1411	0.1403
11	T11 Social Sciences	0.6920X	0.1955	0.3400	-0.0227	0.1111
12	T12 Nursing	0.1199	0.4049	-0.0258	0.2671	0.5715X
13	T13 Mathematics	0.3189	0.4812	0.5562	0.3459	0.0556
14	T14 Education	0.6771X	0.0878	0.0969	0.3976	0.2591
15	T15 Education	0.4108	0.1155	0.3514	0.3915	0.2697
16	T16 Education	0.3689	0.6133	0.1411	0.2700	0.4446
17	L01 Education	0.1362	0.1541	0.2032	0.6543X	0.3325
18	L02 Education	0.1463	0.2970	0.6561X	0.3081	0.4449
19	L03 Education	0.0194	0.3704	0.1871	0.7761X	0.1867
20	L04 Engineering	0.1373	0.7405X	0.2849	0.1372	0.2933
21	L05 Education	0.1834	0.4194	0.3408	0.6889X	0.0896
22	L06 Engineering	0.3687	0.5667	0.1031	0.3878	0.2315
23	L07 Medicine	0.6145X	0.2781	0.2047	0.4663	0.0679
24	L08 Education	0.3463	0.3886	0.5123	0.3896	-0.0001
25	L09 Theology	0.0657	-0.0020	0.5278	0.6119	0.4240
Explained Variance (72%)		13	14	12	21	12

Note: F, Factor; T, Tutor; L, Learner.

accommodates these individual differences. They believe that teaching methods need to incorporate a social aspect of learning (34) and that, because EBL is a group process, learning is multiplied in that students can learn from the efforts of their peers as well as from their own efforts (21). They feel that the development of students' transferable skills is a significant part of their university education (46). They believe that experience of EBL is effective in preparing students for the world of employment (48). They reject the suggestion that EBL depends on an oversimplified theory of learning (33), and they reject the idea that the EBL approach is too laissez faire to ensure good learning outcomes (19). They do not believe that the professionalism of tutors is threatened by EBL (32). In relation to management and cost-effectiveness issues, they argue against the suggestion that using EBL is an effective way of freeing up lecturers' teaching time for research activity (42). While they are broadly positive about EBL, they feel that adapting to it can be difficult for students, particularly in the early stages (16). They also believe that adapting to the approach can be challenging for staff, and that lecturers need specific training to use EBL effectively (4).

Areas of difference between the five viewpoints

While there are areas of consensus among the revealed viewpoints as outlined above, there are also points of difference. The factors are contrasted below, each with a descriptive title to aid differentiation. Note: the identifier codes for participants are T = Tutor and L = Learner, followed by the identifier number, e.g. (T11).

Factor 1: Enquiry-Based Learning (EBL) is highly adaptable, but assessment can be problematic

Three individuals, two tutors and one student, exemplified this viewpoint. Factor 1 is the only mindset which believes that EBL is equally suited to all subject areas (8). One of the tutors (T11) representing this viewpoint commented, 'I can't think of places where you wouldn't use it,' adding that EBL can stimulate student learning on a 'dry' subject. Factor 1 disagrees more than any other group with the suggestion that EBL is 'do-it-yourself' education that requires students to teach themselves (29). However, while they are strongly supportive of aspects of the EBL approach (2, 19, 32, and 48), Factor 1 members also believe strongly that the assessment of student learning in EBL is more problematic than with traditional methods of coursework assessment (5).

Factor 2: Enquiry-Based Learning (EBL) can be better than traditional methods, which are often inappropriate

Two individuals, one tutor and one student, exemplified this viewpoint. Factor 2 members believe strongly, and they are the only group who hold this view, that there is a dichotomy between traditional teaching methods and EBL (18). They also feel more strongly than any other group that traditional didactic teaching methods place too much importance on the role of the lecturer (15). They feel very strongly that traditional teaching methods are inappropriate for most students (26). The student (L04) loading on this factor, who was dyslexic, described how 'sitting in a lecture sends me to sleep more than anything else.' The student also commented that, 'with PBL there is assessment all the way through, whereas with traditional teaching methods you can leave it all to the end and get mega-stressed.' Factor 2 is also unique in its view that EBL allows less academically able students to perform better than they would otherwise do (9). However, although generally supportive of EBL, Factor 2 rejects strongly the suggestion that EBL is equally suited to all subject areas (8).

Factor 3: traditional teaching methods are fine, while Enquiry-Based Learning (EBL) is workable but vague

Two individuals, one tutor and one student, exemplified this viewpoint. Factor 3 members believe more strongly than any other group that there is a conceptual 'fog' surrounding EBL (28). The tutor (T02) representing this factor commented that, 'You would have as many different definitions (of EBL) as people that you asked,' and added that students 'are sniffy about it if just one person is introducing EBL.' Factor 3 is the only group which does not feel that EBL is more authentic than

traditional teaching methods in the way it respects the complexities involved in learning (20). Factor 3 members are unique in their view that traditional teaching methods are appropriate for most students (26). Although they have reservations (see also 29 and 31), they feel that EBL does have some benefits (2, 19, 21, 27, 32, and 48).

Factor 4: Enquiry-Based Learning (EBL) produces independent learners with transferable skills

Six individuals, three tutors and three students, exemplified this viewpoint. Factor 4 members believe more strongly than any other group that EBL produces more independent learners than traditional didactic teaching methods (13). They disagree more than any other factor with the suggestion that students come to university to acquire a body of knowledge rather than a set of transferable skills (46). One of the tutors (T05) described the opportunities afforded by EBL as, ‘adding variety ... building in opportunities to build team-working and problem-solving skills ... understanding that knowledge has to be created.’ Factor 4 refutes, more strongly than any other, the suggestion that EBL depends on an over-simplified theory of learning (33). A tutor (T05) in factor 4 commented that EBL, ‘is inspiring and insightful, but not simple ... if anything, the traditional teaching methods are over-simplified ... receiving, remembering and regurgitating.’ They feel strongly that EBL offers advantages to students in relation to learning how to learn (25). A student in this factor (L05) commented that, ‘even with one person you could learn differently on different topics ... EBL allowed for that, for example on paper, or through talking to people ... EBL gives you the independence for you to learn how you learn best.’

Factor 5: Enquiry-Based Learning (EBL) as a process is collaborative and valuable, but also demanding

Four individuals, all tutors, exemplified this viewpoint. Factor 5 is unique in believing that knowing the facts and understanding things are almost completely unrelated (12). More than any other factor, they see the process of discovering information as being at least as important as the ‘product’ of having the information (22). They feel more strongly than any other factor that it is a tutor’s job to make learning interesting (39). One of the tutors (T09) commented that ‘teaching is bad at university; it needs to be improved more and EBL can do that.’ Factor 5 is unique in disagreeing with the suggestion that many tutors already use EBL but without labeling it as such (38). While supportive of EBL, they believe more strongly than any other factor that the facilitation of an EBL group puts more demands on tutors than delivering a prepared lecture (17); one tutor in factor 5 (T08) commented that, ‘the normal system is more forgiving.’

Discussion

The areas of consensus on EBL among the five viewpoints suggest that EBL may be of benefit in a range of higher education teaching and learning contexts. There are also caveats expressed by the participants in relation to the challenge of adapting to

EBL and possible related training needs for staff and students. However, in terms of generalizing from these findings, as the study participants were all familiar with EBL, their views may not be typical of the wider population. Therefore, to expand the discussion of EBL to its introduction and use beyond the capacity building project described above, the data were also considered from an activity theory perspective (see Figure 1, above). The Q methodology data, and related commentary in the literature, suggest possible contradictions between EBL as a *tool* and other elements of the activity system.

Firstly, the study findings suggest a possible contradiction between EBL as a *tool* and faculty *communities*. There are, for example, differences of opinion between the factors as to whether EBL is suitable for all subject areas (8). In the literature, Duch, Groh, and Allen (2001, 40) caution that what works in a medical school setting 'might not transfer well into a typical undergraduate setting for a variety of reasons.' Lecturers' attitudes were seen by some participants as potentially inhibiting the implementation of EBL (43). One tutor (T11F1) spoke of 'old-fashioned pedagogues who dish out knowledge to students, who then have to absorb it,' and commented that, for lecturers, 'letting go of our knowledge and expertise is difficult.' Three of the factors felt that most tutors are uncomfortable departing from their traditional role (45), and there was some difference in opinion as to whether exposure to EBL would make it more popular with staff and students (37). Mills and Treagust (2003, 7) also mention 'faculty resistance' to EBL, while de Graaff and Mierson (2005, 120) comment that 'the traditional educational model of our western society is basically authoritarian'; they suggest that, for some staff, the shift from lecture-based teaching to the role of a process facilitator 'may simply not be possible.' One tutor (T10F2) suggested that effective collaborative learning was possible only 'if we can break down the fears about being honest and open with each other.' Another tutor (T5F4) stressed the importance of staff commitment to EBL, commenting that it is 'critical for the tutor to be a believer in EBL ... EBL can't be half-done ... to do it well requires a lot of effort or the whole thing becomes very weak indeed ... in that sense it requires more commitment from tutors ... setting up and the on-going support ... students can't leave it until the last minute.' Schultz and Christensen (2004, 536) comment that students may get 'very frustrated' with PBL. Savin-Badin (2000, 134) cites 'issues of power and control in the learning context' as potential obstacles to the effective use of PBL.

Secondly, there is a possible contradiction between the *tool* and the *division of labour*. This relates to, for example, issues of ownership and the responsibility for facilitating and encouraging the activity required in EBL programs (29). Thomas (1997, 328) suggests that 'students and tutors need to learn models of group functioning and how to assess when a group is functioning well'. One student (L04F2) commented that 'staff need training to be positive about PBL or it is massively demoralizing for students and their confidence in the programme ... staff need to know what types of information and clues to give.' Three of the five factors agreed that, with EBL, students need guidance and skilled tuition (30). Another student (L05F4) argued that, 'in particular, tutors need guidance on how to guide without controlling the students' choices ... the tutors have to be enthusiastic about EBL or else it wouldn't work and it wouldn't be fair on the students. You get a lot more out of EBL provided the tutors are properly trained and enthusiastic ... They've got to be there all the time to assist you ... you'd be lost without a tutor to

steer you in the right direction.’ Three of the factors feel that EBL facilitation is more demanding of tutors than traditional lectures (17). Boud and Feletti (1997, 121) claim that the changes involved in the roles of teachers and students present major challenges. The role of a PBL tutor can be challenging as it involves not just subject knowledge but, for example, awareness of group functioning, and possible changes in the tutor’s professional identity (de Graaff and Mierson 2005; Margetson 1994). A ‘hands-off’ approach by EBL tutors to their students’ learning may lead to problems. Johnston and Tinning (2001, 161), citing research in nursing curricula, argue that the effectiveness of the PBL facilitator is critical; Grandis et al. (2003, 13), suggest that ‘positive attitudes and group effort’ are the factors most likely to influence the quality of learning involved.

Thirdly, there is a possible contradiction between *tool* and *object*. The findings raise the question of whether EBL is appropriate for all learners (40). One tutor (T02F3) commented that, ‘students are happier using methods they are familiar with.’ One student (L01F4) described the early stages when, ‘there was apprehension ... no one knew what EBL was like, what was required’; another (L04F2) commented that PBL is extremely frustrating at the start as ‘the answer’ to problems was not always apparent. Although very positive about EBL, the student described ‘going off on unproductive tangents ... therefore you need supportive tutors.’ In the literature, Houlden et al. (2001, 76) suggest that problems ‘may arise because students lack problem-solving and interpersonal skills needed to benefit from PBL.’ One tutor (T09F5) commented that ‘students are our bread and butter ... getting teaching right improves performance and retention ... induction to EBL is very important...for example with overseas students.’ Teetson Walker and Price Lofton (2003) suggest that, after using PBL, there may be a decline in students’ perceptions of their own abilities. In relation to web-based EBL, Woodfine, Baptista Nunes, and Wright (2005) suggest that students with dyslexia may be disadvantaged in a synchronous e-learning environment.

Fourthly, in relation to assessment, there is a possible contradiction between the *tool* and the *rules* of the activity system. There is some disagreement between the five factors as to whether assessment of EBL is more problematic than traditional methods of coursework assessment (5). One tutor (T11F1) commented that assessing the learning process as well as the outcome was problematic in that colleagues had realized that their students’ marks were beginning to rise, which led to a change in their approach to assessment. Another tutor (T14F1) never assessed process, asking, ‘How do you do that?’; the tutor also commented on the difficulty of determining who was contributing in a group, who was a ‘passenger,’ and the ‘distance travelled’ by the students. In the literature, Myers Kelson (2000, 330) argues that the development of proactive lifelong learners requires a congruent assessment system which reinforces and models the approach to problems that is required of them. Schwartz, Mennin, and Webb (2002, 162) comment that, ‘student understanding of the purpose, method and outcome of assessment is crucial to success.’ However, Newman et al. (2003, 3) argue that, ‘there is little agreement about what the specific measurable outcomes of PBL are or how they should be measured.’ Holmes (2004, 126), reporting on an EBL program for the professional development of teachers, felt that ‘much of the positive impact’ resulting from the EBL was ‘beyond the reach of our traditional quantitative measurement devices.’

Fifthly and finally, the challenge of implementing EBL suggests a possible contradiction between the *tool* and the university as *subject*. One tutor (T04F5) cautioned that EBL as a tool can improve quality, 'providing it's used appropriately – you can misuse it.' In the literature, Goodnough (2006, 314) describes PBL as 'a very complex instructional approach.' Albanese and Mitchell (1993, 52) advise that 'caution be exercised in making comprehensive, curriculum-wide conversions to PBL.' Margetson (1994, 12) argues that problem-focused education 'offers no prospect of a quick fix.' Financial costing of the resource implications also needs to be taken into account (Cooner 2005; Hay and Katsikitis 2001). Morrison (2004) suggests that PBL may be less cost effective than traditional teaching methods. Woodward (1997) comments that numerous factors conspire to challenge PBL program evaluators; the variables involved in PBL can make comparing interventions a difficult task (Newman 2003; Prince 2004). Norman and Schmidt (2000, 725) note of PBL that, 'the little acronym covers a multitude of sins.' Perhaps understandably, reviews on the effectiveness of PBL have not been conclusive (e.g. Albanese and Mitchell 1993; Berkson 1993; Van den Bossche, Gijbels, and Dochy 2000; Vernon and Blake 1993).

Conclusion

The findings of the study suggest that EBL may improve the quality of teaching and learning, that adapting to EBL can be difficult for both students and tutors, and due consideration should be given to their training needs. Given the nature of the participant sample, these findings are suggestive only and no claims are made regarding their generalisability. Local practices will emerge within specific activity systems; to make effective use of EBL, the participants in any given learning community may wish to consider and review collectively their ways of engaging with each other, in terms of teaching, learning and assessment. In different contexts, as Wenger (1998, 61) indicates, the 'reification must be re-appropriated into a local process in order to become meaningful.' Q methodology offers a theoretical basis for understanding the diversity of viewpoints relating to EBL, and the revealed areas of consensus and difference may be of interest to those developing EBL curricula. However, as Bella, King, and Kailin (2003, 71) suggest, to understand complex issues, the 'condition that demands attention is the context as a whole.' The elements of any given environment will interact with each other. To understand and manage the way in which EBL might unfold in a particular learning context therefore requires consideration of how the different elements of the system interact.

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Appendix 1

Table A1. Q-sort values for Factors 1–5.

The factor arrays indicate the average ranking of each of the 48 items by the individuals associated with each factor.

0 = neutral; +/–1 = mildly agree/disagree; +/–2 = moderately agree/disagree; +/–3 = strongly agree/disagree

Statements in italics indicate a consensus in the responses to that item.

	Factor arrays				
	F1 <i>N</i> = 3	F2 <i>N</i> = 2	F3 <i>N</i> = 2	F4 <i>N</i> = 6	F5 <i>N</i> = 4
There are too many untested assumptions regarding the usefulness of EBL. (1)	0	–1	0	0	–1
<i>EBL can improve the quality of teaching and learning. (2)</i>	+3	+2	+1	+3	+2
Students who do part of their program through EBL should, as a result, perform better on the other parts of their coursework. (3)	+1	–1	0	+1	+1
<i>Lecturers do not need any specific training to use EBL effectively. (4)</i>	–2	–3	–2	–2	–3
With EBL, the assessment of student learning is more problematic than with traditional methods of coursework assessment. (5)	+3	+2	–1	0	–1
EBL is attractive to universities mainly because the management think it's a relatively cheap way of delivering learning programs. (6)	–2	0	+1	–1	0
<i>Most students are interested in new ways of learning, providing the lecturer encourages their initial interest. (7)</i>	+1	+3	+2	+1	+3
EBL is equally suited to all subject areas. (8)	+2	–3	–2	0	–2
EBL allows less academically able students to perform better than they would otherwise do. (9)	0	+3	–1	–1	0
<i>The idea that students have different 'learning styles' is dubious. (10)</i>	–1	–3	–3	–3	–2
Students do not learn effectively unless they are given responsibility for their own learning. (11)	0	+2	+1	+1	0
Knowing the facts and understanding things are almost completely unrelated. (12)	0	–2	–2	0	+2
EBL produces learners that are more independent than those who learn through traditional didactic teaching methods. (13)	+2	0	0	+3	+2
In terms of overall cost, traditional teaching methods are cheaper than EBL because larger numbers of students can be 'processed' in one go. (14)	+1	0	+1	0	+1
Traditional didactic teaching methods place too much importance on the role of the lecturer. (15)	0	+3	–2	+1	+1
<i>Adapting to EBL is difficult for students, particularly in the early stages of 'learning how to do it'. (16)</i>	+1	+2	+3	+1	+1
The facilitation of an EBL group puts more demands on tutors than delivering a prepared lecture. (17)	0	+1	+1	–1	+3
There is a dichotomy between traditional teaching methods and EBL. (18)	–2	+3	–1	–1	0

<i>The whole EBL approach is too laissez-faire to ensure good learning outcomes. (19)</i>	-3	-2	-3	-2	-1
EBL is more authentic than traditional teaching methods in the way it respects the complexities involved in learning. (20)	+1	+2	-1	+2	+2
<i>Because EBL is a group process, learning is multiplied in that students can learn from the efforts of their peers as well as from their own efforts. (21)</i>	+1	+1	+2	+2	+3
Regardless of the teaching method used, the process of discovering information is at least as important as the 'product' of having the information. (22)	+2	+1	0	+1	+3
Deep engagement with a complex problem is the most effective way to learn. (23)	+1	+2	0	+2	0
Students who use EBL probably remember less of the acquired knowledge than they would do if they were following traditional teaching methods. (24)	-1	0	-1	-2	-2
Traditional teaching methods are as good or better than EBL in terms of students learning how to learn. (25)	-1	-1	0	-3	-2
Traditional teaching methods are appropriate for most students. (26)	0	-3	+2	-2	-1
An advantage of EBL over traditional teaching methods is that students are immediately compelled to apply their knowledge to the problem they confront. (27)	+2	0	+2	+2	+1
There is a conceptual 'fog' surrounding EBL. (28)	+1	-1	+3	0	-1
EBL is 'do-it-yourself' education that requires students to teach themselves. (29)	-3	0	+1	0	-2
Without guidance and skilled tuition, students wouldn't know where to begin with EBL. (30)	0	0	+3	+1	+2
The value of EBL has been over-stated because of the emotional appeal of giving students 'personal autonomy' in their learning. (31)	-1	0	+1	-1	0
<i>The professionalism of tutors is threatened by EBL. (32)</i>	-3	-2	-3	-2	-1
<i>EBL depends on an over-simplified theory of learning. (33)</i>	-1	-1	-1	-3	-2
<i>Teaching methods do not need to incorporate a social aspect of learning. (34)</i>	-2	-2	-1	-1	-1
Enquiry is learning – that is true both in your education and in your professional development. (35)	+3	-1	+3	+3	0
EBL can produce equally competent practitioners in a shorter time than traditional teaching methods. (36)	-1	+1	-1	+1	0
EBL is likely to become more popular as more lecturers and more learners are exposed to it. (37)	0	+1	-1	+2	+1
Many tutors do already use EBL, but without necessarily using that term. (38)	+2	+1	+2	+2	-1
<i>It is not a tutor's job to make learning interesting. (39)</i>	-1	-2	-2	-2	-3
EBL is only as good as an individual student's personal history, including their cultural experiences, and it is therefore not suitable for all learners. (40)	-1	-1	+1	-1	0
When making decisions about distributing resources within and between departments, academic research performance should take precedence over teaching. (41)	-2	0	-2	-1	-3

<i>Using EBL is an effective way of reducing lecturers' teaching time so that they can spend more time doing research. (42)</i>	-2	-2	-3	-1	-3	<i>28 T. Deignan</i>
The attitudes of individual tutors are potentially the main barrier to the effective wider implementation of EBL. (43)	+1	+1	-2	0	+2	
University structures and procedures* are probably the main barrier to the effective wider implementation of EBL. *(QAA, timetable, lack of communication between departments, etc.) (44)	-1	+1	0	0	0	
Most tutors feel uncomfortable going outside their traditional role of knowledge provider. (45)	+2	-1	+1	0	+1	
<i>Students come to university to acquire a body of knowledge, not to acquire a set of transferable skills. (46)</i>	-1	-1	-1	-3	-1	
The main purpose of university should be to prepare students for employment. (47)	-3	-2	0	+1	+1	
<i>Experience of EBL is effective in preparing students for the world of employment. (48)</i>	+3	+1	+2	+3	+1	