"Before You Know Where You Are, You Have a Sequence" - Designing for Inquiry-based Learning with the Learning Activity Management System (LAMS)

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Abstract

This paper reports some of the findings of a project which, using a qualitative research/evaluation methodology, investigated the fit between practitioners' pedagogical purposes, values and practices in designing for inquiry-based learning, and the features and functionality of the Learning Activity Management System (LAMS) as a tool for creating learning designs. The research identified variation in participants' conceptions of inquiry-based learning pedagogy, and in their approaches to inquiry-based learning design. LAMS was found to offer affordances that are compatible with more strongly teacher-led conceptions of, and approaches to, inquiry-based learning pedagogy. The paper draws some implications for the further development and use of design tools for inquiry-based learning. The authors suggest that, in addition to tools created for teachers, there may be a valuable role for tools that explicitly support networked learners as designers of their own learning processes and activities.

Keywords

design for learning, inquiry-based learning, LAMS, Learning Activity Management System

Introduction

This paper reports some of the findings of an evaluation project funded by the Joint Information Systems Committee (JISC) of the Higher Education Funding Council for England as part of its Design for Learning programme (2006-7). 'Design for learning' is defined by JISC as "the process of designing, planning and orchestrating learning activities" (JISC, 2006). Underpinned by a broadly constructivist position on learning, in which active learner engagement is understood to be central to the educational process, this definition accords a key role to the design and facilitation of 'activities' in educational practice. It reflects a shift of emphasis in the e-learning development context from a primary focus on digital content creation towards increasing interest in the use of digital tools and environments to support this aspect of practice.

One such design for learning tool is LAMS (Learning Activity Management System), an open source tool developed at Macquarie University, Australia. Created specifically to enable easy design, orchestration and sharing/reuse of sequences of learning activity, and placing special emphasis on supporting collaborative and group processes, LAMS can be used in classroom-based or distance learning, either on its own or in conjunction with other tools and environments. Its design interface offers practitioners (academic staff) a range of activity templates combined with the means to arrange these into sequences and add associated content. For example, a sequence might start with small group discussion followed by web research and resource-sharing, followed by large-group discussion of the results in relation to material provided by the tutor, ending with individual reflection and note-making. LAMS does not

provide an entirely new toolkit. Much of what it offers - for example, bulletin boards, synchronous 'chat' and survey/quiz tools - is also available in virtual learning environments (VLEs) such as Blackboard, WebCT and Moodle. However, VLEs have been subject to critique on the grounds that they more readily support content-delivery than activity-oriented pedagogies (e.g. Britain, 2004). The functionality and features of LAMS are intended to encourage and support these pedagogies. Although some previous evaluations of LAMS in HE have elicited mixed responses (e.g. Masterman & Lee, 2005) positive feedback in terms of directing practitioners' design thinking in activity-focused directions and providing inspiration in design for learning, have also been reported (e.g. Dalziel, 2007) .

The evaluation project discussed in this paper was motivated by an interest in exploring the potential of LAMS to stimulate and support pedagogical development in inquiry-based learning (IBL). Entitled *DeSILA: Designing and Sharing Inquiry-based Learning Activities,* it was based at the University of Sheffield. Using a qualitative research/evaluation methodology, the project set out to investigate the role and value of LAMS for creating, orchestrating and sharing/reusing designs for IBL in arts and social sciences disciplines in particular. It was underpinned by an understanding of design for learning as situated action; that is, as influenced by the beliefs and values held by designers in specific contexts of practice. The project was less interested in evaluating the features of a specific version of LAMS (it mainly used version 1, which has now been superceded) than in more generic issues raised for the development of practice and tools for design for IBL. Aspects of LAMS functionality - such as the ability to easily orchestrate sequences of online information-gathering, sharing and discussion - appeared to offer promise in relation to learning activities for some forms of IBL. At the same time, creative, activity-conscious design thinking was seen as a key to further developing IBL pedagogy. One strand of the project focused on exploring the fit between practitioners' pedagogical purposes, values and practices in designing for IBL, and the features and functionality of LAMS as a tool for creating learning designs. Project findings relating to this strand are discussed in this paper. The focus of this paper is solely on experiences of *creating* designs for learning using LAMS, rather than on the orchestration of designs with students.

Inquiry-based learning

IBL can be identified, broadly, as a form of active learning with theoretical roots in constructivist and socio-cultural models of learning that emphasise the role of the learner as producer, or co-creator, of knowledge. Students' exploration, investigation or research drives the learning experience. Through IBL, discipline- and practitioner-based approaches to research and scholarship are modelled in the students' learning experience, using inquiry activities and projects that may be small or large in scale. Students often work collaboratively and use digital technologies to interact with peers and tutors, access information, and produce and share outputs. There is a close connection, philosophically and pedagogically, between some forms of IBL and networked learning as a specific approach to e-learning (e.g. Goodyear, 2003).

Formal definitions of IBL (and variants such as research-based learning and guided inquiry) differ, as do pedagogical approaches. Problem-based learning (PBL) is a close cousin of IBL, and some forms of IBL draw on PBL protocols to structure the students' experience. As emphasised by Hutchings (2007), the fundamental element of all IBL is *the question*, whether established by the student, the teacher, or by negotiation amongst them. Often, the question will be an open-ended one, to which differing responses - rather than one correct answer - will be valid, although some forms of IBL focus on questions to which answers already exist. Sometimes embedded into a case or problem scenario, inquiry questions provide the point of departure for student learning through an emergent process of exploration and discovery, with guidance from the teacher working in a facilitative role. While some IBL approaches are designed principally to facilitate students' exploration of the existing knowledge-base of their discipline, others invite their participation in building new disciplinary knowledge. There is generally a strong commitment to the development of student autonomy and responsibility, so students may be offered a choice in questions to pursue, or how to pursue them. Pedagogical strategies reported in the literature range from more directed, teacher-led approaches, in which the teacher may set the questions and offer a great deal of guidance and support on approaching the inquiry process, to more flexible, student-led approaches in which students have a significant degree of control and ownership in developing their own questions and activities. Hutchings (2007: 19-20) suggests that,

"the truest, most radical and empowering forms of enquiry-based learning are those which endow students with the challenge, freedom and responsibility of determining all - or at least as much as is possible - of their learning within the field […] such enquiry-based learning is closest to replicating genuine research and is its ultimate power as a learning method".

Evaluation questions and methodology

The questions explored in this paper are as follows:
- How do practitioners in this study conceptualise and approach IBL?
- What are their existing approaches to design for (inquiry-based) learning?
- What are the affordances of LAMS as a tool for creating IBL designs, and stimulating engagement with pedagogical values and practices associated with IBL?
- What are the implications for the further development of design for learning tools for IBL?

The data reported here were generated through one-to-one and (in one case) one-to-two interviews with twelve members of academic staff (referred to below as P1-P12) who participated in a trial of LAMS during the academic year 2006-7. Interviews lasted between half-an-hour and an hour. All but one of the participants were based in arts and social sciences disciplines, the exception being from an applied science. Most attended an introductory workshop about LAMS, during which they were shown an example of a LAMS sequence created for an IBL activity, and were interviewed before and after designing and implementing a LAMS sequence in their own teaching. They were asked to consider LAMS in relation to IBL, as they conceived of this pedagogical approach and used it, or were developing it, in their own practice. They were also asked to describe their usual approaches to the design process. They were provided with support for creating designs, when desired, in the form of technical and pedagogical advice on a one-to-one basis, supplemented by some technical guidance materials. A small minority of the practitioners looked at existing LAMS sequences as they went about creating their own, accessed via the LAMS community website and the server on which sequences generated through the DeSILA project were held. None had experienced using LAMS before.

Findings

Conceptions of, and approaches to, inquiry-based learning

The broad view that IBL involves *"getting people to learn through doing research"* (P1) was at the heart of all practitioners' conceptions. This in some cases meant that IBL was perceived as closely aligned with formal, discipline-based research practice, as in the view of it as, *"synonymous with the whole research process from question formulation all the way to presentation of the research findings"* (P2). In other cases, the research process engaged through IBL was perceived as a looser and more generic learning process of critical (and self-critical) questioning, exploration and investigation, with IBL defined broadly as encouraging 'inquiring' students to set their own learning goals, plan their learning process, and reflect on the outcomes. A problem-solving dimension was highlighted by some practitioners.

The concepts of learner reflexivity and, in particular, autonomy, independence and ownership were central to the ways in which these practitioners expressed their pedagogical purposes in the context of IBL. Typically expressing a desire to *"help students learn for themselves"* (P3), practitioners spoke of themselves as facilitators of learning rather than as teachers or instructors: *"kind of letting them teach each other and teach themselves"* (P3). Some spoke of the challenges they faced in this role, in terms of the desire to step back and allow students greater freedom than is usual in higher education teaching. However, the IBL conceptions and approaches they described varied along a spectrum that included strongly teacher-led and strongly student-led versions at either end. Individuals often explained their own inquiry pedagogies in flexible terms, in that they would adopt different forms of IBL in different educational contexts. This might differ according to level of study:

"There are two ways to carry out an inquiry, one is to be very explicit and say this is the inquiry you are going to carry out, and it will have the following steps, and the reason for doing it is this, and you are going to do this and this. So that is going to build into an inquiry, a kind of scaffold […] the other type of lesson might be the whole lesson itself mirrors the process of inquiry so students don't

know where they are going, they don't know why they are going there. They will find that out and it is actually the experience of not knowing where you are going and making sense of it that is important […] I will use different approaches at different times with different levels" (P4).

IBL was seen as a pedagogy that would be oriented, depending on the context, either towards enabling students to pursue *"their own interests that they wish to investigate"* (P5) or towards *"students searching for answers to someone else's questions, and having to reflect on certain points of the inquiry"* (P6). The 'purest' forms of IBL were sometimes identified as those in which students both devise their own research questions and direct the development of their projects with guidance and support from supervisors or tutors. A strong process focus was often emphasised, with the purpose of enabling students to learn how to embark on, and pursue, self-directed inquiry:

> "It's that notion that [students] have to learn how to approach a task […] What I would like them to get out of it is not the end result of the process […] it's to focus them on the process of getting to that […], in the process of which they need to do a fair amount of inquiry" (P7).

IBL was often characterised in terms of 'open-endedness', in terms of multiple possible lines of inquiry and the potential for multiple outcomes. One practitioner described a variety of possible IBL experiences:

> "IBL could have a single answer at the end of it, but many approaches to getting to the answer. Alternatively it might have one approach with many different answers, or it might have many approaches and many different answers to that original question, or problem" (P2).

Designing for inquiry-based learning

Practitioners described the experience of design for learning as a highly contextualised practice, with specific 'learning outcomes' normally providing an initial point of departure and a wide range of contingent factors - such as student level and numbers, cultural considerations and timetabling - taken into account. They described two broadly contrasting approaches to design practice: 'content-oriented' and 'process-oriented'. When approached from the perspective of content, considerations of subject-matter were the primary point of departure: *"I would say my teaching to some extent is content-driven. What content do I want to communicate to students?"* (P8). When approached from the perspective of process, objectives relating to students' learning experiences and activities were a primary point of departure: *"I think first about the learning activities and then I try to find content to fit it"* (P7). The design of assessment activities was highlighted as an integral part of a process-oriented approach. One practitioner described focusing first on objectives relating to students' "holistic" experience of learning, and then on specific learning content and activities:

> "I used to start from what content I want to put in. I think that leads to poor design so I now start from, what do I want the students to get out of it. I don't mean in terms of learning outcomes, I mean in a bigger holistic experience so not just what do you want them to be able to do at the end of the course, but what experience do you want them to have of learning, and I start from there and then I think OK, what is the content and we can put in this and also what are the activities and approaches that are going to foster the experience that I am looking for" (P4).

Some practitioners explicitly identified designing for IBL as a process-oriented approach: *"The learning is being achieved by collaboration and joint knowledge construction and so what is more important than the content or the materials is the process by which people learn"* (P5). Individual accounts of designing tended to illustrate (sometimes strong) orientations towards either content or process considerations as a point of departure. However, others reflected an holistic perspective in which content and process were perceived as inseparable and in dynamic interaction. Designing was experienced as an iterative process of movement back and forth between considerations relating to each of them. One practitioner argued for a need to achieve 'balance' between a focus on process and content,

> "I think there is a danger when you rely on activities and tasks that why you are doing it can get lost. It is the balance of thinking, what is really important in the subject, and what it is really important they engage with, also thinking what they can contribute as well" (P8).

The study highlighted a further broad dimension of differentiation in the ways in which practitioners approached design for learning. Some described designing largely in terms of drawing on their own personal conceptualisations of the processes or subject-matter with which students would engage, often drawing attention to the emergent and organic nature of the design process and the need for responsiveness to immediate contextual factors 'on the fly' in the classroom. Others described drawing on different types of generic framework for design, whether process- or content-oriented. None described the use of a specific process or activity model, as might be provided, for example, by Kolb's (1984) experiential learning cycle or by design protocols for problem-based learning. However, the impact of 'generic' conceptualisation was evident in descriptions of design as the creation of sequences of learning tasks based on procedural activity structures embedded in disciplinary or professional practice, whereby 'step a' must be followed by 'step b' and so forth. The established framework of a discipline's knowledge or procedural structures could almost make 'design' a redundant concept, as in this (content-oriented) description of the shaping influence of the generic, external logic of the discipline's knowledge structure: *"...there is no planning to do. It is really how much time you give to topics, and the topics naturally build on top of each other"* (P9).

Figure 1 represents these dimensions of variation in designing for learning, as identified in this study. The vertical axis differentiates, on a continuum, between considerations oriented primarily towards students' experiences of learning, and those oriented primarily towards subject-matter. The horizontal axis differentiates between those that are inflected more by 'generic' pedagogic or disciplinary frameworks and models, and those that derive more from practitioners' personal pedagogical goals and perspectives. Presented as a matrix, the framework identifies four distinct approaches to (or emphases in) design for learning.
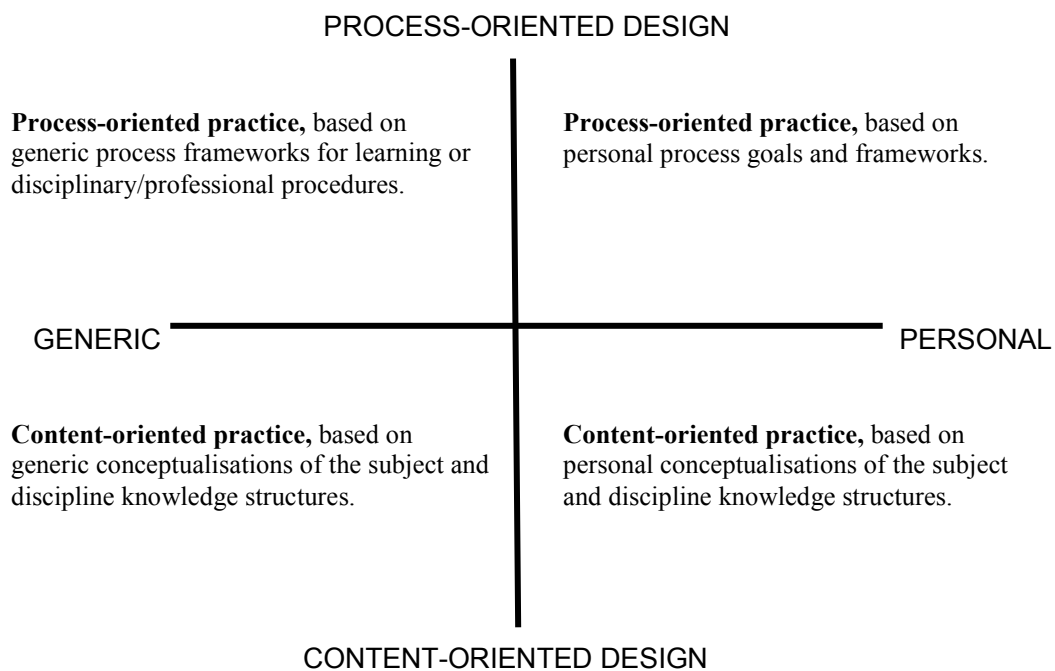
PROCESS-ORIENTED DESIGN

Process-oriented practice, based on generic process frameworks for learning or disciplinary/professional procedures.

Process-oriented practice, based on personal process goals and frameworks.

GENERIC   PERSONAL

Content-oriented practice, based on generic conceptualisations of the subject and discipline knowledge structures.

Content-oriented practice, based on personal conceptualisations of the subject and discipline knowledge structures.

CONTENT-ORIENTED DESIGN

Figure 1: Approaches to design for learning

LAMS affordances and IBL

This section briefly discusses the pedagogical and design 'affordances' of LAMS for IBL, as reflected in the ways practitioners responded to the tool. We take affordances to be, not inherent properties, but relational and contingent, constructed through fluid, socially and ideologically mediated interactions between people and tools. Laurillard et al. (2000: 3) explain affordances as *"features perceived by an observer* [that] *create the possibility for a certain kind of behaviour"*. Oliver (2005) has discussed the contested and multiple uses of the concept in the learning technology literature; we use it broadly here to

refer both to those features of a tool that are intended to encourage particular types of action, and those that offer new possibilities for action.

Linear learning

All practitioners perceived 'linearity' as the principal characteristic of the way in which LAMS supports - and shapes - design for learning. This was reflected in a range of metaphors and similes they used to describe it. Most - ladder, interactive workbook, flowchart, training manual, Powerpoint slideshow, sequential computer game, Russian doll - conveyed a strong sense of LAMS as a tool for designing and reinforcing linear learning pathways. This modelling of learning and its facilitation as step-by-step, forward progression was identified as either positive or problematic for IBL, depending on pedagogical purposes and context. On the one hand, it was welcomed as a means of reinforcing sequential inquiry processes and procedures: *"One step builds on the other and* [students] *don't have to do it all in one go, they can go in, dip in and out, have the chance to reflect"* (P10). On the other hand, linearity was perceived to be in tension with more open-ended forms of inquiry in both social science and arts disciplines, and therefore with IBL approaches that themselves emphasise open-endedness and iteration, and allow for digression. From this perspective, LAMS was perceived to be oriented more towards *"programmed"* learning or *"training"* - even when it was recognised that *"it doesn't have to be like that, it depends how the sequences are written"* (P2). The version used in the trial did not allow for the design of sequences through which students would be able to move rapidly and then return to the start or other points along the way, or return to activities they had already exited. 'Branching' options to easily facilitate the creation of multi-level, in-parallel activity sequences were not yet available. These were seen as major problems by those who conceived of IBL as a fundamentally iterative and 'parallel-processing' experience. One practitioner commented that:

> "Trying to make [activities] linear is sort of actually reinforcing the students' idea that it is all simple and easy [...] If you're emphasising that [inquiry's] not a step-by-step process, then you know, it's a bit counter-productive if they then have a sequence that's entirely linear - it's sort of going against the learning goal!" (P11).

Others saw the linearity of LAMS sequencing as seeming *"to want to impose"* (P8) a serialist rather than holist learning style, or as incompatible with the learning approaches of specific groups, such as postgraduate professionals: *"The way they learn is not linear but more individual reference around their experiences. LAMS is not quite flexible for that"* (P5). Some pointed to a sense of in-built, stage-by-stage closure associated with the sequential model.

The 'linearity affordance' was also associated with small-scale inquiry activity, or bite-size fragmentation of a larger process. For practical reasons, novice users of LAMS were more willing to experiment initially with creating and implementing small-scale sequences than sequences that might extend over a long inquiry process and period of time. Nevertheless, LAMS was perceived as especially suited to design of short activity sequences, for example to supplement face-to-face classroom activities. Its value as a tool to design more complex, holistic and longer-term inquiry processes was questioned. For example: *"I wouldn't see it as a vehicle for heavy-weight, reflective inquiry-based activity, but I think it's something that's nice to put in your sort of blend of teaching"* (P11).

Tight structure and teacher control

In general, tight activity structure and relatively high levels of teacher control emerged as key affordances. Some practitioners envisaged (and created) tightly-structured designs that they considered would offer students a useful degree of autonomy and responsibility in the inquiry process. One commented that, *"I prefer learning activities to be structured to a certain extent, so we've kind of chosen areas of chaos for them to go and do their inquiry around"* (P12). 'Tight structure' could be a welcome feature in the context of introductory forms of IBL:

> "I actually think with students who may not be familiar with IBL, LAMS offers in its structured way, a very good way of scaffolding them [...] I think it does help, if you like, more novice IBL learners, you can use the discussion boards and forums and set specific tasks. It is not entirely open-ended inquiry" (P4).

The potential for the teacher to *"lead by the hand"* (P11) - even at a distance, was identified as very helpful in some contexts, not least to ensure that students would engage with tasks as set:

> "I like the fact, and I don't like to use the word 'force' - but I like the fact that it does force students to actually do it, because for me if I want students to discuss something and then move on to another activity, LAMS will allow me to do that" (P10).

Encouragement towards tighter structuring was also perceived as helpful from a teaching perspective: *"It forced me to be very clear at each point exactly what I wanted from the students because you have to write some of these little signposts for them"* (P7). At the same time, the perceived in-built orientation towards tight activity structures was seen to militate against the principles of open inquiry and student autonomy and freedom. There was a widely shared sense that LAMS was a tool that most obviously supported - and therefore encouraged - strongly teacher-led pedagogy: *"I think LAMS lends itself to a teacher-driven approach; in our course we'll not do that, that often"* (P5). Some practitioners explicitly identified LAMS with "instructivism". One practitioner commented that, *"It's like conducting an orchestra […] Really what I am trying to do is learn how to orchestrate less […] How might the students themselves orchestrate the learning experience?"* (P8).

Process-oriented design
LAMS offered a close fit with the broadly process-oriented nature of designing for IBL. The majority of the practitioners did not report that engagement with LAMS had had a radical effect on their design thinking. Several used the tool to broadly replicate designs they had already used in face-to-face teaching, while others had new ideas sparked for small-scale activities. However, there was a suggestion that engaging with LAMS could impact, alongside other influences in the institutional environment, on orienting thinking towards more process-oriented approaches to design: *"That has been a major change […] I think [LAMS] is an easy way to get into thinking about teaching and learning in terms of activity"* (P8).

The ease of creating designs with LAMS, in technical terms, was perceived very positively, both in terms of the speed with which it was possible to 'get up and running', and the ease of making adjustments during the design process. On the other hand, some practitioners described experiencing their own initial responses to the tool as mechanistic and unreflective, reinforcing the need for access to pedagogical guidance and exemplars. For example:

> "It's very, very easy to build up […] and before you know where you are, you have a sequence of one thing leading to another. I suppose that's a naive way of using LAMS [but] I have found it very difficult to get to the stage where I can appreciate that LAMS can allow you to do [something more flexible for learners] It invited you to think you can create - and then, the truth is, it's very easy to make boring e-learning. The tool, as you know, is easy, but what you don't know is how you should use it" (P1)

Shifting perceptions
The affordances of linearity, tight activity structure and teacher-control were generally to the fore early on in exposure to LAMS. However, initial perceptions could shift over time:

> "I have had different stages in approaching LAMS […] I am beginning to see possibilities for LAMS sequences which nevertheless allow learners' autonomy […] In other words I am finding ways of overcoming the apparent, or what initially appeared, a very constrained form" (P8).

Another time, he would aim to *"stand back"* from the tool and plan a design before creating it in LAMS: *"I think I would not rush to develop the LAMS sequence so quickly. The trouble is it looks exciting, it's new, it's easy. You get zoomed into it and think that is all it can do"* (P8).

Discussion and concluding comments

LAMS offered a close fit with the process-oriented nature of designing for IBL in terms of the foregrounding of 'activity', and was perceived as a promising tool for some forms of IBL in a range of disciplinary contexts. At the same time, our study serves as a reminder that activity-centred pedagogy

may also be strongly teacher-led. While the potential transformational impact of LAMS was not fully tested in this small-scale study, there was little evidence that the tool *per se* (in version 1) supported or stimulated strong engagement with ideas and values underpinning more open-ended and student-led approaches to IBL - those which, arguably, represent this pedagogy in its *"truest, most radical and empowering form"* (Hutchings, 2007) and are closest to 'networked learning' conceptions of e-learning. Consistent with the findings of previous research (Masterman & Vogel, 2007) LAMS was not associated with a fundamental shift in underlying pedagogy, and there was some perception of a constraining effect. To this extent, the tool was not experienced as pedagogically neutral.

We conclude, therefore, that 'activity focused' functionality as offered by LAMS in the version we tested is valuable for the design of more tightly structured, teacher-led forms of IBL but is not sufficient in itself to orient pedagogical thinking and practice in the direction of more open and student-led practice. Our findings also suggest the more general point that there may be a risk of engaging a somewhat mechanistic response to design for learning. We believe that this reinforces the importance of supporting practitioners to 'step back' during the design process to explore underpinning pedagogical purposes and values, for example through interactions with educational developers and peers, or through access to pedagogical planning tools such as those piloted by the JISC Design for Learning programme (see http://www.jisc.ac.uk/whatwedo/programmes/elearning_pedagogy).

We hope that our findings will prove useful in informing on-going development of LAMS and other design for learning tools. Based on our study, we offer the following general considerations:

- That explicit design flexibility is desirable, to facilitate the creation of either tightly-structured or looser designs, and to respond to the needs of both serialist and holist learners;
- That access to a variety of 'process models' is desirable to support process-oriented design and different design approaches;
- That there may be a valuable role for tools that explicitly empower 'networked' students to take the lead in designing, managing and adjusting their own learning and inquiry processes, and to use design representations as resources for reflection and sharing with other students.

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