Cover Sheet for Proposals ***(All sections must be completed)***	JISC **e-Learning Programme**

Name of Call Area Bidding For (tick ONE only):	
Call I: Transforming Curriculum Delivery Through Technology (JISC funded)	**X**
Call I: Transforming Curriculum Delivery Through Technology (Becta funded)	
Call II: Assessment demonstrators	
Call III: Course description and discovery	

Name of Lead Institution:	University of Bristol
Name of Proposed Project:	eBioLabs A personalised virtual environment to support laboratory-based bioscience.
Name(s) of Project Partner(s):	Department of Biochemistry, University of Bristol Department of Chemistry, University of Bristol Learning Science Ltd

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Length of Project:	24 months		
Project Start Date:	October 2008	**Project End Date:**	September 2010

Total Funding Requested from JISC:

Funding Broken Down over Financial Years (April - March):

April 08 – March 09	**April 09 – March 10**	**April 10 – March 11**	

Total Institutional Contributions:

Outline Project Description

This project aims to transform the delivery of laboratory-based courses in the biosciences by deploying and evaluating a personalised learning space. Today's larger and more diverse learner cohort coupled with the decreasing unit of resource has tended to make laboratory sessions more facile and "cookbook"-like so it is no surprise that learners say that practical classes are long, boring and tedious and are one of the least popular parts of the curriculum. It is the aim of this project to transform the delivery of laboratory-based courses and realise their potential to be some of the most active, discovery-led sessions learners encounter in their university careers.

eBioLabs will achieve this by building on the experience and expertise gained by the AIMS and ChemLabS CETLs to provide learners with tools that allow them to interact with and contextualise the tasks to be accomplished within a multilayered virtual environment. As well as possessing an electronic assessment functionality, the environment will contain an individualised repository for learners to record and reflect on their achievements, as well as tools to allow learners to interact with each other and with their instructors. This rich functionality will facilitate the redefinition of laboratory classes from sessions where learners are passive consumers to ones where they can interact more positively with the subject material, each other and staff.

I have looked at the example FOI form at Appendix B and included an FOI form in the attached bid (Tick Box)	**YES**	
I have read the Circular and associated Terms and Conditions of Grant at Appendix D (Tick Box)	**YES**	

Withheld Information Form

We would like JISC to consider withholding the following sections or paragraphs from disclosure, should the contents of this proposal be requested under the Freedom of Information Act, or if we are successful in our bid for funding and our project proposal is made available on JISC's website.

We acknowledge that the FOI Withheld Information Form is of indicative value only and that JISC may nevertheless be obliged to disclose this information in accordance with the requirements of the Act. We acknowledge that the final decision on disclosure rests with JISC.

Section / Paragraph No.	**Relevant exemption from disclosure under FOI**	**Justification**

1. Fit to programme objectives and overall value to the wider community.

1.1. Introduction. The learning aims and objectives of laboratory sessions in any discipline include instilling the skills required to work safely and confidently in the laboratory and gaining experience in how to use a specific piece of equipment and/or how to carry out a specific technique. These sessions are intended to illustrate and supplement material delivered in a lecture, tutorial or workshop where there are manual skills that cannot be acquired without hands-on practice. As well as being vital tools for subject-specific areas of the curriculum, laboratory sessions help to teach "softer" skills such as teamwork, communication and time management. Laboratory sessions are a time when learners and staff can interact in a less formal environment and act as catalysts for group cohesion.

1.1.1. Although development of the curricula is an ongoing process the essential laboratory skills required in the biosciences have changed little over the last twenty years and are not expected to change radically in the near future. The same cannot be said of learners. Today's cohort is more diverse and has greater expectations than ever before and the laboratory curriculum must reflect this. So it is worrying to report that one of the biggest challenges facing university-level educators is how to efficiently deliver laboratory-based courses to an increasingly diverse student body.

1.1.2. Learners entering degree-level bioscience courses today come from a wide variety of backgrounds and experiences and not all have had access to the appropriate resources or opportunities required to equip them for effective learning in the laboratory. This is especially apparent in the biosciences where the cost/benefit ratio of teaching laboratory-based skills has been brought into sharp focus by the change in the set of skills required by graduates, large numbers of who leave the biosciences on graduation, coupled with the decreasing unit of resource available for each student[1]. Learners entering HE today have a wider range of knowledge, skills, motivations and aspirations than was previously the case and this, coupled to the reduced experience of practical work in school, may contribute to year 1 students being ill-prepared for the experience of practical sessions at university[2,3]. As a result of these factors the amount and type of laboratory work carried out and the engagement of learners with practical work has been identified as one of the key issues in teaching bioscience courses[4]; it is widely recognised that far too many students engage in passive learning behaviour during what should be some of the most active, interesting and discovery-led sessions in their university careers.

1.1.3. The aim of this project is to enhance the learning experience by making the learning outcomes of laboratory sessions more explicit, more relevant, and by reducing the "cook book" approach to practical work that the decreasing student/staff ratio has encouraged. We will achieve this by changing the delivery to include a personalised learning space that will allow instructors and learners to interact with the subject matter and each other in a deeper and more productive manner than is currently possible. The University of Bristol is uniquely positioned to accomplish this goal as we will be building on the experience of the ChemLabS and AIMS CETLs both of which can show significant achievements in some of the areas addressed here (www.chemlabs.bris.ac.uk/, www.bristol.ac.uk/cetl/aims/).

1.1.4. We intend to radically alter the assessment regime from the current system of *pro-forma* scripts handed in by learners sometime after the end of the laboratory session to one where diagnostic, formative and summative pre-laboratory assessment of the skills and knowledge required to succeed is an integral part of the experience. These pre-laboratory learning opportunities will be made available to learners on-line via a personalised Moodle 2.0 based interface. This interface will allow the archiving and retrieval of data by learners and staff and be used as an e-portfolio of laboratory experience. Sitting alongside these learning assets will an on-line laboratory manual containing the contextualised information required by the learner to succeed.

1.1.5. The on-line laboratory manual will contain information about the laboratory session (currently delivered in printed booklet form) but will have the immense advantage of being dynamic, interactive and searchable with contextual links to further information. Where appropriate the manual will include feature-rich multimedia such as interactive animations and videos to illustrate skills and techniques so the learners can arrive in the laboratory feeling confident about the task to be accomplished. In designing the manual we will build upon know-how gained by the ChemLabS CETL which has developed and successfully deployed something similar for the chemical sciences.

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1. Brown, C.A., Calvert, J., Charman, P., Newton, C., Wiles, K and Hughes, I.E. (2005) Skills and Knowledge needs among recent bioscience graduates – how do our courses measure up? *Bioscience Education electronic Journal* volume 6, available at www.bioscience.heacademy.ac.uk/journal/vol6/beej-6-2.htm

2. Save British Science (2004) SBS Survey of Secondary School Science Teachers, available at www.savebritishscience.org.uk/documents/2004/SBS0401.pdf
3. Save British Science (2003) Skills and knowledge of students entering higher education.

4 The Higher Education Academy Centre for Bioscience (2008) HEA Biosciences Biochemistry Report.

1.1.6. In addition to pre-laboratory user-driven on-line assessments and post-session on-line submission of work we aim to carry out short *viva voce* assessments in the laboratory. This procedure has two main advantages over existing arrangements. Firstly as an assessment technique it is rich, individual and accurate. It provides immediate feedback while being immune to plagiarism. Secondly the *viva voce* will empower a second community of stakeholder, the postgraduate instructor or demonstrator.

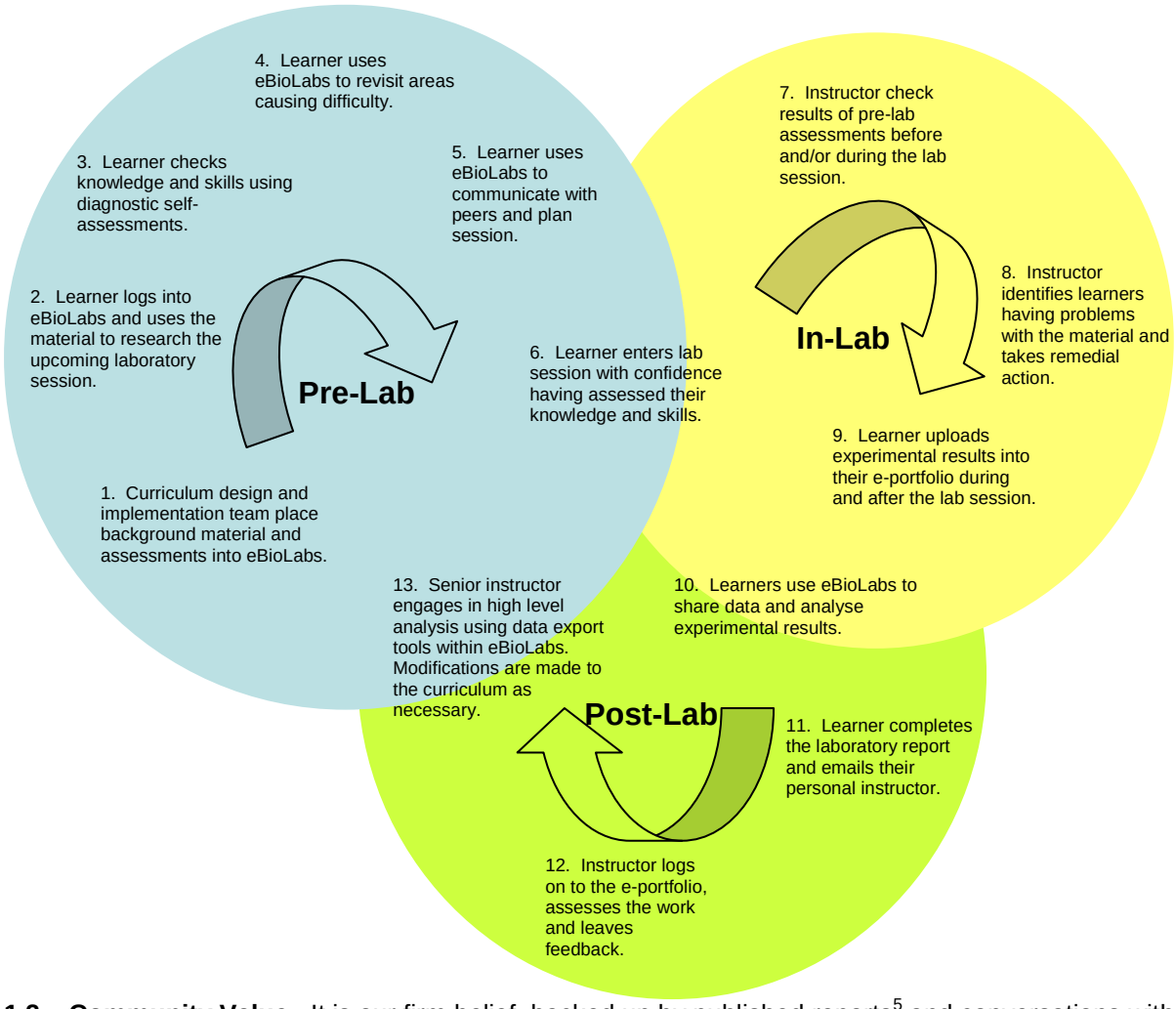
1.1.7. Postgraduate instructors currently receive very little formal training and may feel little responsibility towards the learners. We intend to challenge this by involving demonstrators more fundamentally in the learning and discovery process and we will achieve this partly by making them responsible for named learners. We will develop a demonstrator training course using material similar to that designed for the undergraduate learners but extended into specific areas required for them to succeed as instructors and assessors. Although our research indicates that simply making tutors responsible for direct and individualised learner assessment encourages them to engage more deeply with the material and the learners, the instructors will be required to complete the relevant course prior to the laboratory session. Successful completion of the instructor course will contribute towards their postgraduate skills training portfolio (http://staffdev.ilrt.bris.ac.uk/staffdevelopment/courses/directory/).

1.1.8. Prior to and during the laboratory session staff will be able to check the results of the pre-laboratory assessments from a networked device to identify particular areas where learners are experiencing difficulty. This will inform the instructors in real time of any remedial action required by the learner or learners. Of particular note here are any issues of laboratory safety – these can now be identified before the start of the session with obvious benefits. Learners may be inputting data acquired during the experiment directly into their e-portfolio using devices located in the laboratory or may be recording data for input at a later date.

1.1.9. After the session has finished learners may take part in group activities such as the sharing of results and preparation of reports. These activities will be facilitated by the Moodle-based system that will take advantage of “e-learning 2.0” constructivist features to enable efficient peer-to-peer collaboration. Learner created material will be placed into individual e-portfolios for on-line assessment by staff. This will greatly assist in the reduction of the administrative burden placed on staff at present – in the School of Medical Sciences alone we estimate that 20,000 individual pieces of student work per annum derive from laboratory sessions. At present this work is marked and returned to the learners by hand with the almost inevitable yet deeply unsatisfactory result that occasional pieces of work go missing.

1.1.10. Feedback will be delivered to the learners via their e-portfolios which will give them an opportunity to respond and reflect at a time best suited to them. Results of the assessment and learner reflections will be immediately available to staff which will allow them to engage in high level analysis of the outcomes of the laboratory sessions in a way barely possible at present due to the difficulties inherent in collating handwritten feedback from multiple instructors.

1.1.11 Flow chart / timeline.



1.2. Community Value. It is our firm belief, backed up by published reports[5] and conversations with colleagues from academia and industry that our problem is not unique to Bristol and that the solutions that we propose have value to any course that is reliant on laboratory or field work. The technological and procedural systems that we will develop, deploy and evaluate during this project will be transferable to many courses, not just within Bristol and not just within the Biosciences. Colleagues from areas as diverse as engineering and modern languages have stated to us that our approach could be used to improve parts of their curricula. For example colleagues have reported that learners are often underprepared for modern language workshops. It is possible to see how placing material required for the tasks within an eBioLabs-like framework would allow the learners to more easily research the subject matter, test their skills prior to the workshop and record their findings afterward for on-line assessment.

1.2.1 The immediate scope of this proposal is to deliver between four and six laboratory sessions in biochemistry to a cohort of around 230 year 1 students and 18 instructors. Once we have the initial results of our evaluation (early in 2010, see Workplan) we will be in a position to consider extending the scope in other directions. We have various plans - expanded upon later in this document – that will ensure we maximise the appeal of our approach and ensure sustainability. But please note especially the attached letter of support from the HEA Centre for Bioscience Subject Centre endorsing our bid and seeking to extend our approach to all of the 26 disciplines they support.

1.2.2. An important yet under-recognised feature of laboratory sessions is the opportunity they provide for social interactions. Not only do they enable the community of learners to interact constructively with each other, they also provide a rare chance for year 1 learners to interact with members of staff in a relatively informal setting. These interactions can have major benefits in terms of peer-to-peer learning and group cohesion and is something that we intend to formally recognise and encourage. We will do this partly by assigning each learner a personal named instructor but also by designing collaborative working, assisted by the technology, into the curriculum.

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[5] 1. Brown CA et al, Bioscience Education eJournal, 6-2, 2005.

2. Workplan

	10-8			1-09			4-09			7-09			10-09			1-10			4-10			7-10		
	Q1			Q2			Q3			Q4			Q5			Q6			Q7			Q8		
Review of current practice																								
Understand and define challenge																								
Plan curriculum delivery																								
Management group meetings																								
Web presence																								
System development / support																								
Pilot new practice																								
Staff training																								
Project goes "live" to learners																								
Evaluation																								
Dissemination																								
Embedding / sustainability																								
Progress report																								

2.1. Planning. The first three months of the project will include a review of current practice and activities to help us understand and define the challenge. During this we will identify the skills and techniques that are currently taught and which of these will most benefit from delivery using an interactive laboratory manual and which are better learned using more traditional methods. We will continue this process until we have identified the learning assets required for between four and six three-hour laboratory sessions. During this process we will lean heavily on our experience gained running the large-scale e-learning activities pioneered by the AIMS and ChemLabS CETLs (www.bristol.ac.uk/cetl/aims, www.chemlabs.bris.ac.uk).

2.1.1 The nine month process of planning the curriculum delivery will help to develop the timetable with IT partners. During this time techniques will be trialled and decisions made about which methods of delivery will be used (examples might be asynchronous activities such as learner-created wikis, instructor–created static web pages, Flash animations, video etc or synchronous activities scheduled during the laboratory session, or a mix of the two). More detailed plans of the development of the individual elements will be drawn up, usually in the form of meetings of key staff to storyboard the information flow between learners and learners and instructors. During this stage focus groups made up of learners, postgraduate instructors, staff and other stakeholders will be formed to increase our understanding of the task. The management group will contain experts from outside the curriculum area and Institution (see below) in order to maximise the utility of the project to others.

2.2. Piloting New Practice. A single laboratory technique and associated pedagogical assets including a statement of learning objectives, assessments (electronic and otherwise) and learner scenarios will be developed, evaluated and reviewed by to the management group within the first six months of the project. The pilots will then gradually increase in scale until the project goes live in October 2009. This process will be invaluable in helping us assess our progress and will be vital in helping us to train instructors.

2.3. Web Development. Web development will commence immediately after the review phase. The largest proportion of this work will be in the period leading up to October 2009 (when the project will 'go live' with the students) but will continue in a minor way until the end of the project.

2.4. Full-Scale Trial. The project will go live in October 2009 to a cohort comprising 230 year 1 Biochemistry students and 18 instructors. eBioLabs will deliver between four and six three-hour laboratory sessions between October and early 2010. By this stage the new course will contain material designed to give the student the skills required to undertake the laboratory tasks with confidence. This will include on-line material germane to the session and tools, such as on-line diagnostic assessments, designed to help instil learning alongside materials intended to help postgraduate instructors' understand their duties and responsibilities. Appropriate collaborative tools available in Moodle will be used and developed to support reflective learning. For example, a likely scenario is the development of on-line collaborative activities for learners to share and present data they have collected during the laboratory sessions. Systems would be put in place to allow on-line feedback to be given to the learners and for them to respond and reflect on their learning.

2.5. Management Group. The management group will oversee and guide the development of the project. It will meet formally every quarter and will include scientists and e-learning experts, including

suitably qualified people from outside the University of Bristol to ensure the wide appeal of our approach is maintained. See section 5.2.7 for details of membership.

2.6. Evaluation & Measure of Success. Evaluation will commence with the pilot and will continue throughout the project, feeding back into the development process. Evaluation design will begin right at the start and will draw from the model put forward by JISC (www.jisc.ac.uk/elearningeval). Learner-centric measures of success will be evaluated against statements like, 'An increased number of Bristol students continue their education at PhD and masters levels as a result of inspirational laboratory courses' (tangible) or 'we make biochemistry more fun and more relevant'. Where possible, tangible measures of success will be sought but it is expected that many measures, such as the students' attitude towards the laboratory, are less tangible and evidence of success will be more anecdotal. By the end of the project we will have developed between four and six new laboratory sessions and tested the system "live" on a cohort of around 230 Biochemistry students and 18 instructors. Thus one measure of success (from the instructor viewpoint) will be whether we were able to successfully assess the outputs of between 920 and 1380 laboratory sessions in 230 individual e-portfolios. Successes will be measured in many ways, but our ability to train staff in the new system and ensure a seamless transition from the current paper-based system to an electronic one will be evaluated using interviews and focus groups and through forums such as the staff Teaching Committee.

2.7. Risks.

Risk	Probability (1-5)	Severity (1-5)	Score (P x S)	Action to prevent and/or mitigate risk
Staffing issues	2	3	6	Most key staff are already in post. Expertise is widespread and replacements are available if necessary.
Technical aspects too complex.	1	4	4	Technology being used is well-understood and similar to previous work. We will seek appropriate and pragmatic solutions.
Partnership fails to work effectively.	2	4	8	Effective project management techniques will be used to ensure difficulties are resolved and targets are met in a timely manner.
Timescales	2	4	8	The project will follow an iterative model to ensure any problems are addressed at the earliest opportunity. User functionality will be the priority. However, the team's track record of meeting deadlines is excellent.
Low learner engagement	2	5	10	Effective consultancy at all stages of the project. Close monitoring of material delivery and staff training programme.
Low stakeholder (non-learner) engagement	2	5	10	Effective consultation throughout the project lifespan coupled to the resolute and professional dissemination of a shared vision.
Over ambition	3	2	6	This project will only tackle a limited and defined area of the curriculum. The management group will need to be aware of the potential for scope creep.
Solution becomes subject or institution specific	2	5	10	Stakeholders from other subject areas and institutions will be included on the management team and consulted throughout.

2.8. Indicative Deliverables.

- A reusable model for providing personalised, portable, flexible tools to assist with the delivery of laboratory courses in biochemistry, but adaptable to other subject areas that are reliant on laboratory or field work.
- Enhancements to Moodle to support this model.
- Reports and case studies detailing our findings

- Evidence for whether this model provides a more engaged learner cohort with a better understanding of practical science and skills that will help them develop as proactive lifelong learners.
- Evidence of tangible administrative benefits: a reduced administrative burden with fewer marking and recording errors.
- Postgraduate instructors with better developed transferable and interpersonal skills.

2.8. Time Commitment. This project engages with support services for ICT at the University level, though the Education Support Unit and at Faculty level though the e-Learning Support Officer and also draws upon more specific expertise from within the University. An appropriate proportion of staff time has been allocated.

3. Engagement with the Community

3.1. Identification of and engagement with the community. We are committed to identifying and engaging with key stakeholders and communities, including those in other subjects and institutions in order to ensure the project's long-term success.

3.1.1 We will spend the initial planning period of the project identifying key stakeholders and establishing relationships with key partners in relevant areas. The size and importance of the problem we are tackling does mean that we will engage stakeholders' attention relatively easily. For example note the attached letters of support from 1) Dr Snowden, Vice President at GSK, the largest pharmaceutical company in the world and one of the largest employers of bioscience graduates in the UK, 2) Dr Adams, Head of the HEA Subject Centre for Bioscience and 3) students who have seen something of what we are attempting to do following exposure to the ChemLabS CETL. As this project will go live in October 2009 we will have the opportunity to fully evaluate the strengths and weaknesses of eBioLabs and produce a final system that caters to the needs of various types of stakeholder.

3.1.2. The Departments of Chemistry and Biochemistry at the University of Bristol are committed to the JISC Support and Synthesis project and will release staff at all levels to allow them to contribute 35 and 25 days to the project in years 1 and 2 respectively.

3.2. Dissemination. Dissemination will begin early in the lifespan of the project in order to inform colleagues of the upcoming changes to the year 1 laboratory course. Internally this will be through awareness and training events at Departmental, Faculty and University level. To engage with the wider community we will draw upon the outreach experience of the AIMS and ChemLabS CETLs, using media such as newsletters and events organised by HEA Subject Centres, professional bodies such as the Academy of Medical Sciences and conferences such as Alt-C. We will also produce publicity material for distribution to colleagues both within and without the university but especially to departments at other Universities with whom we have a good measure of influence. Interested parties will be driven to the project website which will include a demonstration version of e-learning elements and pedagogical approaches. The fact that this project will have a very tangible output that will be showcased in a highly visible manner year after year will make dissemination easier. See section 3.1 for how we will identify key stakeholders and communities.

3.3. Embedding and Sustainability. Sustainability means that changes to curriculum delivery must be embedded into current practice and become a permanent change. We believe that the project as proposed is consistent with this ideal as the tangible output of the project will be a self-contained delivery vehicle requiring no further development. We fully expect that eBIoLabs will quickly become an integral and indispensable part of the first year experience

3.3.2 The cost of maintaining and supporting the hardware and software is being met by the University of Bristol. The School of Medical Sciences has made a commitment to e-learning that includes the creation of a new permanent post that will support this project for the foreseeable future.

3.3.3. The changes we are proposing to postgraduate instructor training makes this community an important stakeholder in eBioLabs and there is an increasing pressure from funders to provide evidence of transferable skills in this group. We will investigate ways of matching these two observations in order to extend the development of eBioLabs. We will also look into including learner-generated content, a practice which is already being successfully piloted in the Department of Physics and at the Veterinary School at the University of Bristol.

Initial Stakeholder Mapping	
User	**Need**
Community	Proof of concept of the flexibility of this approach. Ease of integration. Evidence that transferable skills are being learnt. Quantifiable benefits.
Learners	To be enthused about the material. A clear understanding of the experiments' aims and objectives. To maximise their study time before the experiment takes place. A flexible and personalised ways to interact with the subject material. To be challenged on their understanding. Individual feedback, both from formative and summative assessment. To be able to reflect on their achievements. To develop transferable skills.
Instructors and staff	High quality information about learner achievement. A stable, reliable and intuitive platform. Responsiveness and flexibility To "buy in" to the concept Good training

3.4. Summary of Benefits of eBioLabs to the Lead Institution. Quantitative benefits include a reduction of the administrative burden associated with assessing laboratory work; although the total quantity of assessment will remain approximately the same, placing the work on-line will streamline the process for staff. The opportunity to participate in the Synthesis project, attend conferences and meetings is welcomed.

3.4.1 More qualitative benefits include increasing the number of learners who more fully achieve the learning outcomes of the laboratory sessions which will allow subsequent learning to take place more efficiently. There is also the opportunity to have a positive impact on laboratory safety and group cohesion. We believe that synergy, kudos and partnerships will result from increased interactions with colleagues in AIMS and ChemLabs as well as dissemination and outreach activities with the wider community. The greatest beneficiaries of eBioLabs however, will be the learners and instructors passing through the laboratories who will enjoy a greatly enhanced learning experience. It is for these reasons that the institutional contributions have been set at 45% for this project.

5. Previous Experience

5.1. Scope of the project. The task involves transforming the delivery of techniques and skills currently taught in bioscience laboratories onto an interactive e-learning platform. The scope is this project is to meet the very diverse needs of the large student body in year 1 Biochemistry. This represents a small portion of the bioscience laboratory curriculum and excludes, for example, explaining apparatus that is specific to a particular piece of equipment to allow us to focus on generic skills.
5.1.1. The scale of the task is exceptionally well understood because key partners have developed similar resources (AIMS and ChemLabs CETLs). The consortium can thus be confident that estimations regarding staff time and web development are accurately realistic.

5.2. Key Staff. The team we have assembled includes practicing scientists who have decades of experience teaching and practicing laboratory-based science (and who all have experience developing e-learning material), and e-learning specialists who have the relevant technical expertise and scientific background. The team have had previous experience in managing projects of this nature or larger.

5.2.1 Dr Gus Cameron (Research Fellow, Department of Biochemistry, University of Bristol). Gus will be project coordinator. Before taking up his post at Bristol Dr Cameron taught a diverse learner cohort at South Bank University for five years. This was in addition to spending three years teaching at a FE college where he developed and delivered a highly successful and innovative Biochemistry course to learners from non-traditional backgrounds. Dr Cameron has been intimately involved in course management and curriculum redesigns and has an on-going commitment to widening participation. Dr Cameron has recently held a faculty-wide e-learning role while still remaining active in his research laboratory. Dr Cameron has years of experience as project manager of a multinational public-private drug discovery project whose members spread across two countries and three sites. He can justifiably claim to have an excellent understanding of the needs of the many types of stakeholders impacted by this project.

5.2.2. Dr Paul Wyatt (Director of Bristol ChemLabS). Paul will act as senior consultant on the eBioLabs project. As well as being involved in laboratory design, IT hardware and laboratory infrastructure, Paul's major role has been in the educational design of the new labs. He chaired a Working Party which considered the skills students needed, the experiments they needed to do, the timetable and the integration of the different years, the new role of demonstrators and the modes of assessment. For the first time, representatives from different Sections of the School literally sat round a table to discuss what was wanted for the students' laboratory experience in what was the most significant root-and-branch rethink of practical laboratories that the School has ever undertaken. Dr Wyatt was responsible for the pedagogic shift that has been made in the School of Chemistry This radical, integrated, rethink started with considering the skills the students needed to have by the end of each year. The period when students think about the experiment was reconsidered (to be before rather than after the lab) as was the period when students are assessed (to be during rather than after the lab). These approaches now ensure that the student gets the most from the lab and is assessed on the work they do rather than their ability to write up after the event.

5.2.3. Dr Tom Podesta (Teaching Laboratory Manager, School of Chemistry, University of Bristol). Tom will coordinate the skills mapping required to convert the current laboratory curriculum into the eBioLabs vision. Dr Podesta is an expert in the design and implementation of practical science classes and an integral member of the ChemLabS CETL team. He was a key member of the working party responsible for the recent redesign of the Bristol BSc Chemistry curriculum. As well as advising the group on all aspects he was responsible for coordinating the output from the groups to produce a selection of practical courses. He was involved in all aspect from writing the experiments, resourcing the equipment through to training the demonstrators. He has also been deeply involved in the design and production of electronic teaching material.

5.2.4. Suzi Wells (e-learning Support Office, Faculty of Science, University of Bristol). Suzi will bring pedagolical e-learning expertise to the project. Suzi is the e-Learning Officer for the Faculty of Science at the University of Bristol, a post she began in November 2006. Her work involves promoting and supporting e-learning within the science faculty at Bristol. Before working at Bristol she was a consultant / project manager at Futuate, a company specialising in the use of e-learning and web technologies. Her work at Futurate included project management for clients including the Association for Learning Technology and the South Yorkshire Passenger Transport Agency, being on the evaluation team for the JISC Distributed eLearning Tools strand and usability consultancy for the Museums Libraries and Archive Council and the Natural History Museum.

5.2.5. New Appointment (e-Learning Developer). A new position is being funded by the School of Medical Sciences, University of Bristol, to help accelerate the development of e-learning projects. The incumbent will develop and deliver material and map the present curriculum onto the eBioLabs vision.

5.2.6. Dr John Eastman (Learning Science Ltd). John will lead the technical design and implementation of the system. John has previously worked with us on the ChemLabS CETL and has a background as a research chemist and in e-learning systems development. John is an expert in the design and scripting of Moodle-based e-learning systems.

5.2.7. Management Group. The Department of Biochemistry will be responsible for managing the project. The management group will include Dr Pete Lund (Deputy Head of Academic Programmes, School of Bioscience, University of Birmingham). Dr Gus Cameron (Project Coordinator, Biochemistry, Bristol), Dr Paul Wyatt (Director of Bristol ChemLabS), Suzi Wells (e-Learning Support Officer, Science, Bristol), Gill Clarke (Director of Education Support Unit, Bristol), Prof. Judy Harris (Professor of Medical Science Education and co-director of AIMS CETL) and Dr John Davis (Academic Director of e-learning, School of Engineering, Bristol). We believe that having a spread of people from differing academic areas and locations will be a valuable evaluation and dissemination tool.

5.3. Previous successes. Central to the project is the experience gained by the two University of Bristol CETLs, AIMS (http://www.bristol.ac.uk/cetl/aims/) and ChemLabS (http://www.chemlabs.bris.ac.uk/). The projects pioneered by these two groups are inter-related and aim to deliver technological solutions to less tractable problems in science education. AIMS has developed a virtual microscope to deliver histology teaching and assessment online and runs a Mobile Teaching Unit to facilitate a range of outreach activities. Their sophisticated Human Patient Simulators have allowed the vertical integration of pre-clinical and clinical years. The ChemLabS project developed a prototype of the laboratory manual proposed here, combining online content with new laboratory space to help transform the way students related to practical work. The ChemLabS project is now in its third year and has expanded the manual to the second year students, with the third year due to come online in October 2008. Senior staff from both CETLs will help to manage eBioLabs.

5.4. Alignment with University objectives. The University is committed to excellence in teaching and is explicit in its objectives. The University's overall intention is to offer a rewarding student experience. It will provide students with:

- An opportunity to engage with the latest thinking and research in their subject area
- Excellent and creative teachers
- A stimulating and supportive environment in which to learn

5.4.1 The Education Strategy includes key objectives and two particular examples relevant to this project are:

- To build on good practice in learning, teaching and assessment, and related administrations, in a co-ordinated way that supports quality and efficiency
- To respond to student needs in all aspects of university life and to ensure students' views, and also the views of those who deliver the teaching, are taken into account in academic, social and cultural matters

5.4.2. Of particular relevance is the University's e-Learning Strategy. All the fundamental principles in this strategy are congruent with the proposed project:

- Delivering student-centred teaching and supporting student learning
- Implementing appropriate and sustainable us of e-Learning in an integrated, blended educational framework
- Ensuring effective and efficient formative and summative assessment.
- Ensuring that our students are regularly updated on their own learning progress and that teaching is informed by student feedback
- Encouraging self-directed learning and peer-support
- Being sufficiently flexible to suit the needs of a diverse student population

5.4.3. Additionally, several objectives for delivering the above principles are aligned with the proposed project:

- Enabling academic staff to take the lead in embedding e-learning in our teaching and learning
- Providing high quality, appropriate e-Learning tools and resources
- Ensuring e-learning is accessible to all students whatever their individual circumstances

5.4.4. Relevant projects and initiative. The university is currently rebuilding the Faculty library to include more social learning space with improved group learning and IT facilities. This project will provide learners with ideal spaces in which to interact with the pre- and post laboratory material. The faculty has also agreed to appoint a full time e-learning specialist who will spend 50% of his/her time working on the eBioLabs project.