

Project Development

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Document

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EGEE e-Learning Pilot – Phase One

1. Background

Current training activities (EGEE NA3 Objectives) are predominantly delivered through scheduled events at distributed locations across Europe. Despite essential, the activities represent one of feasible means for training. The training is accessible at specific time and location junctures based on the arbitrary availability of trainers. These junctures do not necessarily correspond to the availability and requirement of intended learners who are based at dispersed geographical locations, and engaging in various works or projects in different subject domains. The delivery mode in which trainers engage synchronously with learners during class time, would only be effective if learners could grasp the intended learning outcomes in the same pace. This is often not the case since learners have different skills and needs due to project and knowledge background; some may need additional explanations and more reflective times and reference resources to grasp a particular concept.

E-learning can broadly be defined as learning facilitated and supported through the use of information and communication technologies. It has the potentials to enhance the EGEE training requirements. For example, the provision of appropriate e-learning resources such as audio-visual presentations and electronic reference resources allows training to be delivered online, in an asynchronous (self-paced) mode and persisted beyond the training schedule. E-learning also facilitates other training approaches such as *situative* pedagogy which focuses on social practice and dialogue through the use of communication and collaborative working technologies¹.

This document details a project entitled “EGEE Learning” to pilot e-learning for delivering the EGEE NA3 objectives. It is based on the recommendations² from an assessment (see Appendix B for a full report) on the use e-learning for EGEE. The document also reports a 1-year pilot work (to date and plan) to consolidate the identified recommendations from the assessment.

2. Aims and Objectives

The main aim of the project is to pilot e-learning for delivering the EGEE project’s NA3 training requirements.

Objectives - Phase One:

- To source learning objects (content and metadata) of various types including presentations, tutorials, courses and reference objects such as books, journals and articles

¹ See “Using a Virtual Learning Environment” (JISC InfoKit) for additional e-learning scenarios, <http://www.jiscinfonet.ac.uk/InfoKits/effective-use-of-VLEs>

² <http://wiki.nesc.ac.uk/read/egEE-elearning?RecommenDations>

- To pilot an e-learning service-oriented infrastructure
- To develop a EGEE Learning Portal based on the service-oriented infrastructure
- To collaborate with the EGEE and other project partners for evaluating the project outputs, demonstration and dissemination

3. Overall Approach – Service-Oriented

The preliminary assessment for the e-learning pilot has recommended the consideration of service-oriented approach as a suitable requirement for EGEE NA3 project which involves training partners from distributed organisations and locations. The project therefore develops a service-oriented infrastructure which the e-Learning website will build upon. Partners can use the website or develop their custom-built training site using the underlying infrastructure to suit their own requirements. The infrastructure is based on the JISC e-Learning Framework (ELF - <http://www.elframework.org>), a current leading initiative in e-learning and service-orientation.

The ELF framework incorporates diverse services typical to those in the virtual learning environments. Due to the current timeframe of the project (EGEE 1) with near terms deliverables, it considers:

- A core set of ELF common services (which sharable among partners) as a basis for scoping the initial pilot services
- Other services to be scoped and introduced in later stages of the project (2nd, 3rd yearly phases in EGEE 2)
- The first project phase focuses on services to facilitating resource access, management and other peripheral services (authentication and personalisation) which is consolidated in a **digital library** which is part of the e-learning pilot website, i.e. EGEE Learning Portal.

Since it will not be feasible to build all ELF services from scratch, the project reuses and develops off-the-shelf systems and frameworks *as the first resort* to ensure the timely delivery of the project outputs. These include the Fedora repository and GridSphere (for the digital library front-end)

4. Project Outputs

- **Deliverable 1:** Standard-compliant and cross-searchable learning objects & metadata
- **Deliverable 2:** Service-oriented infrastructure
 - **2.1:** Fedora Repository
 - **2.2:** Resource discovery services (ELF: *search, harvesting*)
 - **2.3:** Content and metadata management services (ELF: *content management, metadata management, packaging, rating and annotation*)
- **Deliverable 3:** EGEE Learning Portal
 - **3.1:** Demo Prototype, website to demonstrate the metadata catalogue, the service infrastructure and disseminate project information including web services (WSDL) and OAI harvesting details
 - **3.2:** Digital Library, Building on the demo prototype to provide a fully fledged digital library which includes authentication, authorisation and personalisation use scenarios, targeting EGEE User Forum in March
- **Deliverable 4:** Demonstrations & dissemination, demonstration of the website and infrastructure and encourage use of website and services among EGEE and other partners

Access to current work in progress: <http://wiki.nesc.ac.uk/read/egee-elearning>

5. Project Outcomes

- The advancement of the e-learning interoperability research area; evaluating issues arising from sharing e-learning resources and exchanging metadata schemas.
- The use of the proposed infrastructure will increase awareness of the potential implications of service-oriented system architecture in terms of:

- Demonstrating the benefits and thereby fostering a culture of metadata, resource and service sharing within among the EGEE projects and wider communities
- Advancing the course of common service agenda of the JISC e-Learning Framework Initiative and its parent initiative, e-Framework that also incorporates e-research services.
- The EGEE Learning Portal provides practical solution to address the current needs of NA3 in terms sharing training materials
- Increased collaboration as the pilot development provide a proof-of-concept infrastructure for:
 - Adding values to existing metadata and resources collaboratively
 - Enabling training partners to create and test custom-built training solutions based on their requirements
 - Sharing resources among EGEE partners and projects in other communities, e.g. DILIGENT, BELIEF, ICEAGE

6. Stakeholder Analysis – TBC

7. Risk Analysis – TBC

8. Standards

Name of standard or specification	Version	Notes
FOXML/METS	1.0/1.4	FOXML is proprietary for batch metadata uploading to Fedora
Dublin Core (DCMI Recommendation)	2005-06-13	
Learning Object Metadata (LOM)	IEEE	
Metadata Object Description Schema (MODS)	3.1	
IMS Content Packaging, Resource List Interoperability Specifications	1.1.4, 1.0	
Search & Retrieve Web Services (SRW/U)	1.1	
W3C XForms	1.0	Metadata wiki & annotation
JSR 168 Portlet API (GridSphere)		EGEE Digital Library

9. Intellectual Property Rights

All developments of this project are based on open source software systems and hence subjected to the open source license of the components we decided to adopt. IPR of digital content resultant from the project is subject to EGEE project copyright terms

10. Exit and Sustainability Plans – TBC

11. Dissemination Plan

We demonstrated the work in progress at the UK All Hand Meeting and the EGEE 4th Conference in Pisa, as well as online via the project wiki where the e-learning website can be accessed (<http://wiki.nesc.ac.uk/read/egEE-elearning>). We aim to submit a paper describing the first phase development, to the European Conference on Digital Library (September 2006, Alicante). The test bed is also related to a JISC digital library project at NeSC and collaborating with other projects including DILIGENT and BELIEF, and therefore will be disseminated more widely in the UK and Europe.

Timing	Dissemination Activity	Audience	Purpose	Key Message
Sep 2005	UK All Hand Meeting	UK e-Science	Pilot run for Pisa	EGEE Learning initiative
Oct 2005	EGEE 4 th Conference, Pisa	EGEE and related projects	Demonstrate work in progress	EGEE Learning initiative and work to date
1-3, Mar 2006	EGEE Project User Forum	EGEE and its related projects	Present EGEE Digital Library (DL), the end result of 1 st Phase	EGEE Digital Library
2006 (for ECDL)	Ariadne	Digital Library, Communities	Disseminate project outputs	EGEE DL services
Sep 2006	European Conference on Digital Library (ECDL), Alicante	Digital Library, Publishing Communities	Disseminate final project outputs	EGEE DL services and metadata annotation wiki inc.
Throughout 2006	Dissemination within NeSC	NeSC staff	To ensure its sustainability in UK	EGEE Learning initiative

12. Project Progress and Plan

Project *Phase One*, duration: from 01-04-2005 to 31-03-2006 (12 months)

Deliverables /Month	4	5	6	7	8	9	10	11	12	1	2	3
1: Learning Objects & Metadata			■	■	■					■		
2: Service-Oriented Infrastructure												
2.1: Fedora Repository		■	■						■	■		
2.2: Resource Discovery				■						■		
2.3: Content/Metadata Managem't				■								
3: EGEE Learning Portal												
3.1: Demo Prototype	■			■	■	■	■					
3.2: Digital Library (GridSphere)								■	■	■	■	
4: Demonstration & Dissemination						■	■				■	■
	■	Completed					■	Ongoing				

See Appendix A for the detailed plan per deliverables.

Appendix A. Detailed Plan

Work package and activity	Earliest Start date	Latest End date	Outputs
DELIVERABLE 1: Learning Objects & Metadata			
Objective: To source learning objects (content and metadata) of various types including presentations, tutorials, courses and reference objects such as books, journals and articles			
1. Scope and catalogue reference grid articles and resources from IBM websites. Gather and catalogue EGEE NA3 training materials (in addition to what already exists in the database)	01/06/05	01/8/05	Metadata stored in Excel format Presentations, courses objects and metadata stored in existing training material database
2. Convert 1 st batch metadata into XML (FOXML) and upload to Fedora repository	01/09/05	15/09/05	Metadata catalogue available in Dublin Core format in via the Fedora service-oriented infrastructure
3. Convert and upload 2 nd batch of metadata to Fedora repository <ul style="list-style-type: none"> Reference objects from various publishers, sourced from PALS II <i>metadata+</i> project 	05/01/06	01/02/06	Additional metadata for reference objects: books, journals, articles to supplement the existing catalogue
DELIVERABLE 2: Service-Oriented Infrastructure			
Objective: To pilot an e-learning service-oriented infrastructure			
DELIVERABLE 2.1: Fedora Repository			
4. Implement Fedora Digital Repository on a test server	01/05/05	01/07/05	Project repository (Fedora 2.0) with proprietary web services APIs
5. Migrate to the new 2.1 version and a production server that has additional supports for authentication and authorisation: <ul style="list-style-type: none"> Server hosted at the Edinburgh University Library 	01/12/05	01/02/06	Project repository (Fedora 2.1) on a production server with proprietary web services APIs

DELIVERABLE 2.2: Resource Discovery Services			
6. Develop Fedora Access API (API-A) SOAP services to returns total hits and for results scrolling capabilities	01/07/05	01/08/05	Web (SOAP) services for searching metadata stored in the project repository OAI harvesting service , available by system default
7. Standardised resource discovery service based on the de-facto SRW/U <ul style="list-style-type: none"> Install VTLs Fedora Open Source Components 	05/01/06	01/02/06	SRW/U service available for the metadata stored in the project repository
DELIVERABLE 2.3: Content Management Services			
8. Enable Fedora Management API (API-M) SOAP services for content management including history, versioning, file upload	01/07/05	01/08/05	Web (SOAP) services for managing learning objects and metadata , available by system default
DELIVERABLE 3: EGEE Learning Portal			
Objective: To develop an e-learning website based on the service-oriented infrastructure			
DELIVERABLE 3.1: Demo Prototype			
Objective: Basic website to demonstrate the metadata catalogue, the service infrastructure and disseminate project information including web services (WSDL) and OAI harvesting details			
9. Develop website & a NeSC wiki to provide details of the e-learning pilot	01/04/05	01/05/05	Project website & wiki page http://wiki.nesc.ac.uk/read/egee-elearning
10. Web application (JSP) for demonstrating the resource discovery services (via Fedora API-A)	01/07/05	01/08/05	Basic and advanced search demo
11. Web application (JSP) for editing and updating metadata (via Fedora API-M). The editor is based on W3C XForms server and Orbeon Presentation Server	01/07/05	01/09/05	W3C XForms based metadata editing demo
12. Web application (JSP) for content management services (via Fedora API-M): uploading file, history, versioning	01/10/05	01/11/05	Learning objects upload, update, versioning, history demo
13. Web application (JSP) for exporting (DC/LOM), printing (PDF) metadata and	01/10/05	01/11/05	Metadata exporting, printing and table of

table of content services			content demo
DELIVERABLE 3.2: Digital Library Objective: Building on the demo prototype to provide a fully fledged digital library which includes authentication, authorisation and personalisation use scenarios, targeting EGEE User Forum in March			
14. Install GridSphere portal framework	01/12/05	05/1/06	Gridsphere container
15. Authentication/authorisation - basic and single sign on	01/12/05	05/01/06 01/04/06 (single sign on)	User login and tracking (content management) facilities
16. Develop JSR 168 portlets by reusing content and application from the <i>Demo Prototype (D.3.2)</i> : <ul style="list-style-type: none"> • Project information • Resource discovery • Content management • Metadata wiki 	01/12/05	01/03/06	All demo prototype functions available in Gridsphere
17. Searching external repositories: <ul style="list-style-type: none"> • DILIGENT Training DL • Other, via d+ and <i>PALS II metadata+ project</i> 	05/01/06	01/03/06	Searching DILIGENT and other repositories
18. Resource list services to enable users to create their own learning objects collections	01/02/06	01/04/06	MyLibrary space (tab in Gridsphere) for user to build their personal learning objects collection.
DELIVERABLE 4: Demonstration & Dissemination Objective: To collaborate with the EGEE and other project partners for evaluating the project outputs, demonstration and dissemination			
19. Prototype demonstrations at UK All Hands Meeting and EGEE 4 th Conference in Pisa	01/09/05	01/11/05	Demonstrations to EGEE and other projects
20. Final Phase One demonstrations: <ul style="list-style-type: none"> • EGEE User Forum at CERN • Other events 	01/02/06	01/04/06	Demonstrations of EGEE Digital Library

Appendix B. Piloting e-Learning for the EGEE project

Boon Low, System Developer EGEE User Training and Induction
1st April 2005

Introduction

The provision of training and induction is a core activity of the EGEE project (<http://public.eu-egee.org/>). Current training activities (EGEE NA3 Objectives) are predominantly delivered through scheduled events at distributed locations across Europe. Despite essential, the activities represent one of feasible means for training. The training is accessible at specific time and location junctures based on the arbitrary availability of trainers. These junctures do not necessarily correspond to the availability and requirement of intended learners who are based at dispersed geographical locations, and engaging in various works or projects in different subject domains. The delivery mode in which trainers engage synchronously with learners during class time, would only be effective if learners could grasp the intended learning outcomes in the same pace. This is often not the case since learners have different skills and needs due to project and knowledge background; some may need additional explanations and more reflective times and reference resources to grasp a particular concept.

E-learning can broadly be defined as learning facilitated and supported through the use of information and communication technologies. It has the potentials to enhance the EGEE training requirements. For example, the provision of appropriate e-learning resources such as audio-visual presentations and electronic reference resources allows training to be delivered online, in an asynchronous (self-paced) mode and persisted beyond the training schedule. E-learning also facilitates other training approaches such as *situative* pedagogy which focuses on social practice and dialogue through the use of communication and collaborative working technologies.

This document details a preliminary assessment on the use of e-learning as a means for delivering the NA3 objectives. It also proposes a set of recommendations for a pilot project .

Virtual Learning Environments and Service-Oriented e-Learning

Given its broad definition, e-learning represents a multitude of feasible practices ranging from the use of electronic communication facilities such as email, discussion boards, chat, instant text messaging, video conferencing to specialised tools for online assessment and activities scheduling. The practices may also be feasible in various *connection* modes as determined by different networking and hardware topology, as well as *structural* modes relating to the ways with which e-learning services and tools are organised, aggregated and made available to learners within a learning environment (Wilson 2005).

Whilst *ad hoc* structural modes may be feasible through basic and often homegrown portals (websites) developed by technology-savvy trainers, the use of both commercial and open source virtual learning environments (VLE) has become prevalent, insofar as a centralised and supported infrastructure served by collective organisational resources. A VLE typically integrates a wide ranging e-learning facilities organised in fixed environment and structural modes. It allows some degree of customisation such as switching off/on tools (c.f. dynamic sequencing of learning activities). It also provides a cost-effective and practical means of implementing a range of e-learning facilities. From administration perspectives, it is also easier to support technologies on the same technological platform and from a small number of product vendors. See “Managing for Sustainability” (JISC InfoKit) for further description.

However, the adoption of a VLE should be assessed with respect to a paradigm shift in how applications are being developed for e-learning. There is an increased adoption of service-oriented and distributed computing technologies such as web services and the Grid (JISC 2004b, Gaeta *et al.* 2003). The service-oriented approach associates with the *small pieces loosely joined* principle (Weingberger 2002). It typically derives web services from functional decomposition (unbundling) of legacy and monolithic VLE systems. The approach also decouples data sources and services from their application front-ends and allows them to surfaces in extrinsic application contexts. Diverse and

more flexible approaches to e-learning, particularly those of a cross-organisational nature can be facilitated through custom-built infrastructures that are based on the different composition (structural modes) of the unbundled web services along with any newly developed services. Instead of being technology-led, the development of e-learning can thus be based on the needs and demands of learners. Course developers can select the only e-learning services that are relevant to their course and learners.

There are pros and cons for adopting VLE and service-oriented approaches (Siemen, 2004, Wilson 2005). The debate related to the approaches is ongoing e.g. a recent session at a conference (<http://careo.elearning.ubc.ca/wiki?SmallPiecesLooselyJoined>) which discussed the different categories on the use of instructional technologies. The same discussion also purports a holistic approach to *combine* the use of VLE and service-oriented e-learning since there is no such thing as "one-size-fits-all" VLE; it is also impractical to build services from scratch. It claims both approaches are converging. For example, VLE vendors may provide application and web services interfaces which can be further developed for service-oriented contexts, while e-learning derived from web services may result in common technology (service) composites served in similar environments due to various factors such as similar underlying pedagogy, institutional and business constraints.

Recommendations:

- Adopt an approach combining the use of a VLE (if required) with other service-oriented applications
- Off-the-shelf products considered for this pilot should either be service-oriented or at least "service-orientable", i.e. providing application interfaces for further service-orientation development.

Developing e-Learning Resources and Courses

Related NA3 objective:

- To produce a portfolio of training material and courses from introductory to advanced user material.

The scope of e-learning resources would be diverse as the intended learners have different technical skills and background knowledge, as well as the wide-ranging topics related to the Grid. The resources may also be targeted at external (non-grid) user groups and formal training such as the MSc e-Science Course. Hence a scoping assessment is recommended to review the nature of training within the EGEE and wider context, to determine the scope of e-learning resources.

The EGEE training team has produced a range of training materials organised in 37 modules and 5 courses. Typically, these training materials are resultant from the presentations (PowerPoints) of the training events (<http://egee.nesc.ac.uk/schedreg/index.html>). These materials, in the current forms, are too abstract to underpin online training as they are only meant to be supplementary to the training events which involve detailed explanation and instructional guidance from the trainers. The use of such presentation materials often results in learners asking for further clarification (JISC 2004a).

Based on the Mayes Framework on learning with technology (Mayes and Fowler 1999), e-learning resources and courses can be grouped in different categories, according to the three levels of learning activities which support learners understanding of new concepts:

Primary – providing information in didactic/transmission mode, learners exposed to new concepts through training sessions and accessing online content:

- Presentation slides and handouts
- Instructional and narrative text e.g.:
 - NCESS tutorials (<http://www.ncess.ac.uk/resources/tutorials/>)
 - GridCafe (<http://gridcafe.web.cern.ch/gridcafe/>)
- Lectures, audio-visual resources, e.g.:
 - Synchronous collaborative tools (<http://www.voxwire.com/kolabora/emerget/>)

- References including external websites, books, articles and journals, in the form of resource lists mapped to individual modules.

Secondary – allowing learners develop a better understanding of the new concepts and skills by undertaking tasks and assessments mediated by some level of discussion and feedback:

- Practical
- Formative assessment

Tertiary - allowing learners to use the concept and skills in applied contexts such as developing grid middleware for a new subject area; involving extensive two-way dialogue and collaboration among peer learners and trainers, “It is only at the level of Tertiary Courseware where there is two-way dialogue that learning can occur” (JISC InfoKit):

- Project – software development
- Thesis writing
- Learner presentation of the concept

A set of e-learning resources can be derived from a process of augmentation and repurposing the existing training materials. Given the finite period available for the pilot, it would initially be useful to develop primary resources, particularly as self-paced and reference resources underpinning training at secondary and tertiary levels.

In a longer term, it is important not to focus solely on primary resources, as learning also occurs at higher levels. Indeed most recent e-learning initiatives had mainly focused on the development of primary resources and treated learners as “content canister”. This approach is neither effective nor representative of e-learning as it neglects the essential computer-mediated human interactions. Hence, the EGEE pilot should prioritise on developing good primary resources for a specific subject area (e.g. grid middleware such as gLite) and in a longer term explore resources spanning all three levels of activities. This means providing more hands-on practical, assessment and dedicated training for specific project contexts.

A focus should be given to the reusability and granularity of each e-learning resource as individual units of studies so that they can be reused across different systems and aggregated in different contexts in course structures predetermined by trainers or custom coursed based on learners individual needs (*associative vs. constructive pedagogy*).

Recommendations:

- Undertake a scoping sssessment of existing e-learning initiatives and resources from EGEE partners and NeSC related organisations.
- Develop resources for primary-level learning activities, focus on gLite courses
- Explore and plan for resources for secondary- and tertiary-level learning activities
- Resources should be reusable across different course contexts and based on interoperability standards

Scoping e-Learning Services

NA3 objectives:

- To use this (training) material to train a wide variety of users both internal to the EGEE consortium and from external user groups from across Europe who will make use of this infrastructure
- To engender team spirit across the EGEE activities

The E-Learning Framework (ELF - <http://www.elframework.org>) is an emerging initiative to build a common service-oriented approach for e-learning. It has produced a framework which identifies a range of services ascribed to e-learning and a typical VLE. The services are categorised in two levels of functional granularities - *learning domains* and *common*.

Learning domain services provide higher-level of functional granularity and can be realised via application that aggregates the use of *common services* which identify the underpinning, sharable cross-domain support services. See JISC (2004b) report for further description of the services. The framework also maps each service to the existing or emerging technical standards and interfaces to encourage the adoption of standards and interoperability among the service components.

Part of the ELF services overlap and correspond to frameworks from other sectors, including the emerging JCSR (JISC Committee For Supporting Research) e-research framework, (see JCSR roadmap), the JISC Information Environment Architecture, e.g. for cross-domain use scenarios:

- Facilitating tutorial (e-learning) involving the use of grid infrastructure (e-research)
- Searching reference resources and learning objects (e-learning) stored in existing digital libraries (information environment)

ELF should provide a basis for scoping the extent to which e-learning is applicable to the NA3 objectives. For example, identifying the relevant *service composites* (aggregation) for higher-level applications such as learning object authoring, collaborative working environment, content management, digital library and VLE! ELF currently exemplifies several sample service composites. For a pilot project, it would be pragmatic to derive service composites and reuse any interoperable system artifacts from all related cross-domain frameworks while appraising the current harmonisation efforts (Wilson, *et al.* 2004, Framework Scoping Study project)

The services should be scoped according to the pedagogy requirements (see below) and implemented in appropriate project phases. The pilot should initially focus on developing primary e-learning resources and a core set of services to facilitate resource access and consumption, e.g. providing a training digital library; the later stages may involve the development of secondary/tertiary resources and extended services, e.g. for collaborative working and communication related to additional pedagogical considerations.

Recommendations:

- Consider ELF learning domain and common services as a basis for scoping the pilot services related to EGEE
- Appraise the current development of frameworks harmonization
- Initial project phase should focus on facilitating core services for developing, accessing and consuming primary e-learning resources
- Scope and plan for extended services related to additional pedagogical considerations in subsequent project phases

Pedagogy Consideration

The scoping of e-learning services should also be informed by the pedagogical imperatives, i.e. by considering the various rationales and feasible approaches to learning and teaching. The current EGEE training activities represent only one of many feasible training approaches which have been studied extensively by education practitioners. In particular, learning and teaching activities can be enhanced by observing the following three perspectives on the nature of learning:

- *Associative view* - learning through regular routines of organised activities often led by instructors; learners acquire skills progressively in small and logically-order steps, mastering prerequisites (e.g. XML, Schema) for more advanced composite skills (e.g. WSRF, WSDL). The EGEE training activities currently provide this type of learning in a fixed delivery mode. The evaluation should focus on how associative learning can be provided online and other physical delivery contexts such as university postgraduate courses.
- *Constructive view* - Learning through intellectual activities and processes of discovery, experimentation and reflection, focusing on new forms of understanding. Often led by learners who work at their own pace with reference materials and tutorials (e.g. computer programming) to develop deeper understanding of concepts (e.g. design patterns). It requires interactive and collaborative environments that encourage feedbacks among learners and trainers. For an example of constructive training, see the O'Reilly Learning Lab

(<http://oreilly.useractive.com/courses/methods.php3>) for teaching computing skills.

- *Situative view* - Learning through social practice and participation in communities of practice. This type of learning relies on dialogue within formal and informal settings and is empowered by positive sense of identity within the communities, e.g. a developer work (learn) for an open source project to develop new software by adapting a generic tool. The learning is motivated by personal/group positions within (often real-world) environments. It is therefore relevant to the “engender team spirit” NA3 objective. It also requires interactive and collaborative environments that encourage knowledge sharing and experiments.

For further details on the above perspectives, see Mayes and de Freitas (2004).

The JISC e-Learning and Pedagogy Initiative has produced a matrix tool based on the above views (Fowler and Mayes 2004). It identifies sixteen feasible approaches for training and maps them to the generic activities typically ascribed to learning, e.g. *acquire skills, problem solving, expose to new concepts, theories and facts* etc. For each approach, the matrix also suggests the appropriate teaching operations and tools requirement. The matrix and the pedagogic approaches should be examined with views of how they can be used to enhance the current EGEE training, and which e-learning services could subsequently be adopted to facilitate the required improvements. The latter requires an extended mapping of the matrix against various e-learning services such as those under the JISC e-Learning Framework.

In addition to pedagogic approaches, there is a range of factors which determine how (and how well) training activities can be facilitated. For example, “provide feedback” - an operation common to trainer-led activities can be accomplished in a multimodal training environment, synchronously (e.g. face-to-face, videoconferencing) or asynchronously (e.g. email, forum). This means the same pedagogic approach can be implemented in different variations. The following is a non-exhaustive list proposed recently (Wilson 2005):

- *Interaction*: through web browser, mobile, personal digital assistant, audio-visual devices (off- and on-desktop)
- *Connection*: synchronous, asynchronous, always-on (broadband internet), always-off (CDROM), on-and-off (hotspots, dialup)
- *Structure of resources*: organisation of resources based on courses & modules, personalised resource lists, topics, dates
- *Structure of services*: organisation of services according to pedagogic approach, e.g. guiding learners towards a certain behaviour such as engaging in discussion for situative training
- *Instructional workflow*: static and dynamic sequencing of services and resources according to pedagogic approach, e.g. linear (unit listing), conditional (sequence activities based on learning outcomes), binary (switch on/off services).

Recommendations:

- Review the various training (pedagogic) approaches for a particular EGEE pilot course using Fowler & Mayes matrix
- Map the training approaches described in Fowler & Mayes matrix to ELF services
- If appropriate, specify how various training modes can be delivered (per pedagogic approach) by considering technology factors

Reference

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