Project CALIBRATE - Calibrating eLearning in Schools

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Abstract

Exchange and collaborative use of learning resources is one of the main issues European Union supports through IST Programme. The CALIBRATE (Calibrating eLearning in Schools) brings together eight European countries to carry out a multi-level project designed to support the collaborative use and exchange of learning resources in schools. Its main aim is to provide brokerage system among national repositories of educational materials. The paper reports on main golas of this project, among which are to develop an open source technical architecture to support content exchange/collaboration between Ministries of Education and other owners of educational repositories, to develop an open source, learning toolbox that supports the collaborative use of learning resources, research and test new approaches that can improve semantic interoperability related to the discovery and evaluation of learning resources. One of the quite important issues developed through the project is the guidelines about the metadata resources in the repositories should be equipped with. We will report on two major guidelines the resources in Calibrate should follow. Also some practical examples of preliminary versions of tools are reported.

Keywords: *e-learning, metadata, repositories, learning resources*

1. Introduction

Despite the fact that there are numerous learning resources available on the World Wide Web, there is a constant problem of finding appropriate learning resources to be used in the classroom. The CALIBRATE (Calibrating eLearning in Schools) project ([Calibrate]) is trying to help. It will provide solutions (tools and services) that support the interoperability and adaptability of the Learning Resources on the European scale. The project brings together eight European countries to carry out a multi-level project designed to support the collaborative use and exchange of learning resources in schools. Its main aim is to provide brokerage system among national repositories of educational materials.

In the paper we shall present the main goals of the CALIBRATE project and discuss some problems in adapting educational resources for international use and present some illustrative examples.

2. About the project

CALIBRATE is a 6th Framework project led by European Schoolnet (EUN) that brings together eight countries that are interested in supporting the exchange and collaborative use of learning resources in schools. With support from the European Commission's Information Society Technologies (IST) Programme, the project is expected to develop a European Learning Resource Exchange for teachers and pupils. The work builds on the results of three previous IST projects (CELEBRATE, ITCOLE and VALNET). Beside eight Ministries of Education (or their representatives) the project is involving 17

partners from Austria, Belgium, Czech Republic, Estonia, Hungary, Lithuania, Poland and Slovenia. As project proposal states, the project will:

- Develop an open source technical architecture to support content exchange/collaboration between Ministries of Education and other owners of educational repositories.
- Develop an open source, learning toolbox that supports the collaborative use of learning resources.
- Research and test new approaches that can improve semantic interoperability related to the discovery and evaluation of learning resources.
- Validate CALIBRATE project results in up to 100 schools using an advanced validation methodology.

The CELEBRATE (Context eLearning with Broadband Technologies) pilot project ([Celebrate]) has demonstrated that although teachers are willing to use learning materials from the WWW, this usage is seriously limited by the fact that not enough such materials are available; in particular, not enough areas are covered.

The main goal of the Calibrate was to alleviate this shortcoming: to make enough of the resources available and easily accessible to teachers. For this purpose, the project brought together the ministries of education from eight EU member states, each with their own repository of learning materials. Six of the participating countries are new EU member states, a conscious decision with the goal to promote educational uses of ICT in the enlarged Europe. As one of the partners, representing Ministry of Education, University of Ljubljana (through Department of mathematics, Faculty of Mathematics and Physics and Laboratory for Telecommunications, Faculty of Electrical Engineering), took part in the project. The Calibrate project started in October 2005 and will be running until March 2008.

The idea of this project is quite simple although the underlying technology is quite advanced. Essentially, the project will create a network or federation of learning content repositories. The network will allow teachers and pupils to freely access both learning resources and learning assets (images, simple text files, audio clips etc.) that can be used in the classroom. The search for these assets should be performed in a way teachers are already familiar with and in their own language. Technology behind will take care of producing and federating appropriate searches through participating repositories.

3. Finding educational teaching resources

There is quite substantial amount of teaching and learning resources obtainable through the net. If we just take mathematics into account: sites like http://www.mathcentre.ac.uk, http://www.e-um.si/, http://www.mathe-online.at, http://www.matheprisma.de, http://www.math.com, http://planetmath.org are just few examples of various portals where educational math teaching resources can be found. Simple search on Google with keywords *math*, *teaching*, *resources* gives more than 6.5 million hits. But a survey, conducted in 2005 within Slovene teachers' groups, has shown that teachers do not use enough of the resources made available. The main reason they claim for not using teaching resources is that they need **suitable** teaching resources in order to be able to incorporate information technology into their teaching process. The observation of active usage of e-materials in the teachers' work has shown that access to a large number of e-materials (mostly due to organizing the Slovenian portal (SIO) with links to various educational resources in 1995) after the (expected) initial boom actually led to the reduction of their use in teaching. Interviews with teachers showed several reasons that led to the observed decline in usage. The quality of electronic teaching materials ([Dinevski at all]), the problems with distribution of the materials, too demanding ways of modifying them, and lack of proper classification are only some of the most often mentioned as being the most important reasons for giving up or stopping the usage [Jakončič, Lokar].

On the other hand using and preparing suitable teaching materials in Slovenia is quite challenging. A small population (2 millions) and the obligation to use only native language materials in schools make a small market as well as limit the number of potential authors.

So on one hand we have an overwhelming amount of teaching resources in other languages and lack of the suitable ones in Slovene language ([Lokar]). Same problems were observed also in other countries. Problems with the quality suggest the use of national repositories with quality evaluation and/or control. But this means a significant drop of available resources all over Europe. So an obvious remedy of this situation is to connect repositories and search through all of them. As soon as we try to reduce the number of possible hits we encounter problems with proper keywords, different age settings in different school systems across Europe ... So the reasons for Calibrate project were obvious.

4. Main goals of the project Calibrate

Calibrate has set itself several goals, according to the most pressing needs established by the Celebrate project. Based on these goals, five work packages were formed.

Classification of teaching resources. The school programs (curricula) in European countries differ significantly, but they mostly cover the same set of topics. For learning resources to be easily accessible there has to be a way to search for them based on the curriculum in every teacher's own country. Namely it cannot be expected teachers to be familiar with various school systems across Europe. The task of the first work package is to find the mappings between curricula in several states and create the taxonomy - a set of keywords, with unique mapping to every curriculum.

Learning resource exchange (LRE). As mentioned before, the initial availability of resources is crucial for the success of the project. Since most countries already have their own repositories of learning materials, the natural step is to bring them all together. Most learning resources are accompanied with metadata, which contains a description and data intended to simplify searching. The goal of the LRE is to enable the exchange of this metadata. For this purpose, an international standard format LOM (learning object metadata) is used; it has been adapted in several minor points to better fit the LRE needs. The metadata in the repositories are generally not stored in the LOM format. Therefore, every participating country has to provide an interface for searching and converting its metadata to LOM. The EUN office provides the central brokerage system, needed federated search through all the national repositories, as well as a basic software support to simplify the connection to the brokerage system.

Initial goal was to have all the metadata available in English. Unfortunately, this is generally not the case. There are other projects (e.g. MELT - Metadata Ecology for Learning and Teaching ([MELT])) with the specific goal of enriching the metadata and providing English translations.

LeMill: toolbox for adapting and producing teaching resources. To help teachers adapt the learning material to the specific needs of the class and share the adapted content with others, a web based authoring system named LeMill ([LeMill]) is being developed. Design and adaptation of learning objects in LeMill is based on the cooperative model of work: the materials are stored on the web server and every update is instantly available to the whole community. All the resources in the LeMill are covered by the Creative Commons share-alike license ([CreativeCommons]), which fits such purposes very well. One of the problems that arose is the import of resources from national repositories to LeMill. It is an important part of the Calibrate integration, but it requires the imported resources to carry the same CC license which is often not the case in the national repositories (they are mostly older than CC license).

Apart from that, the cooperative model has several advantages, especially considering the international aspects of Calibrate. A suggested common scenario is the following: a Slovene teacher finds a resource in the Hungarian repository using the federated search. Based on the description (hopefully in English) in the metadata, she decides that she could use it for his classes. If the resource carries the CC-SA license, she can import it into LeMill. She connects with a Hungarian teacher from the LeMill community with a plea to translate the resource from Hungarian to English (or another language they are both familiar with). As the last step, she translates it to Slovene and adapts it for the Slovene curriculum. The next time, the situation is reversed - so everybody wins. As a side effect, the quantity

of content available in mediatory languages (e.g. English) grows, so no work needs to be duplicated the next time.

Evaluation. The evaluation of the project by a test group of teachers is important partly to understand the strong and the weak points of our approach, but even more to create the strategy on how to disseminate the finished product to as wide group of teachers as possible. The evaluation is running in 20 schools in four states. A set of expertly prepared questionnaires will be used to judge the results.

Dissemination. The goal of the project is not only to produce the tools, but also to educate the teachers on how to use them and how to create new resources. We hope to reach the "critical mass" of teachers, which will enable the further use to spread on its own.

5. Classification and metadata

The main goal of the Calibrate project is to help teachers to find and use the teaching materials, not only from their own country's repositories, but from all over Europe.

The first question that usually arises is: why to use Calibrate, not Google? Almost all resources available are already indexed by Google? Yes, they are. But for a text search engine is difficult to differentiate between a teaching resource about "linear function" and an article that just happens to mention "linear function" in the context of, say, economy. Then there is the language issue – standard search engines find many English resources provided that the query is in English. How about finding an Estonian resource with a Slovene query? In educational repositories the metadata are augmented with educational information, with quality evaluations, with copyright information … So the search can be much more "educationally oriented".

Calibrate helps with these issues by using metadata along with the resource. Metadata contains a lot of information that helps the search: a simple description, language neutral keywords (defined by an international thesaurus), the approximate age at which the subject is taught … A lot of metadata already exists in the national repositories and the missing pieces are being added by other projects, like Melt.

An idea that seems to have even more potential is the idea of curriculum mapping. It is still far from finished, but when it works, a teacher can simply click on the today's lecture in the school program and obtain all resources throughout Europe that deal with that.

With this approach a teacher can search through repositories in his own language, but the results she obtains are often in a language she doesn't speak? We hope the community process as described in the paragraph about LeMill will help here. In the future also solutions based on controlled languages (see [Mitamura] for example) could find place in the development of learning materials.

6. Adapting educational teaching resources

One of the important findings during the evaluation is that dominantly text resources don't fit very well with the needs of Calibrate. There are several reasons for that:

- These resources don't "travel well" – they have to be translated to every language to be of any use and the amount of work needed for translation is in many cases nearly equal to the amount of work needed to create the resource from the scratch.
- Teachers have pointed out that the most important benefit they expect from the use of ICT is a way to motivate the pupils - and a text page is just as boring as a schoolbook.
- Almost every school topic is already well covered by Wikipedia, so most teachers will first look there for textual content.

So what are the resources that best fit the philosophy of Calibrate? Well known examples are short movies, simulated experiments and interactive exercises – they don't contain much text to translate and have good motivating effect. Moreover, interactive exercises provide instant feedback, giving the

pupil better opportunity to learn from his own mistakes while relieving the teacher of the tedious task of correcting.

In our opinion, the heart of the problem is the poor ability to exchange content, as Calibrate is all about exchange. The materials in Calibrate must work on different computers in different countries and different languages. The teacher has to be able to cut them, translate them and adapt them to this year's curriculum and today's lecture.

7. The validation framework

Evidence about the usefulness of the products is gathered from the schools in two broad areas: the performance of the product itself; and its general value and potential for supporting new models of pedagogy and schooling, content management and organizational change. A common framework for assessing the impact of interventions in school has been made. As can be seen in [Calibrate Newsletter 1] it has several dimensions:

Systemic dimension. This concerns aspects of the national schooling system. These aspects, for example education policy, teacher education, the legal context, the curriculum, external examinations if we mention just few are largely outside the control of the individual school. Nevertheless they affect what happens in schools. The project will study the results from the other five dimensions and highlight implications resulting from the project that should be communicated to policy-makers.

Institutional dimension. Here we look at the changes due to the CALIBRATE project in the school as a whole: changes in teaching, collaboration and sharing good practice; as well as changes in school ICT culture and its e-maturity.

Pedagogical dimension. This aspect covers the teaching and learning at the individual teacher, student and class level. The main observation regarding teachers will be on the impact digital learning resources have on practice of classroom teaching, mostly on teaching strategies and teaching styles. We will be looking at teachers' way of authoring, adapting, modifying and sharing of learning resources. In learning we will examine four disciplines: Mathematics, Science, Environmental Science and English as Foreign language.

Technology dimension. Mostly this part deals how the project results work in practice. This is about the technical performance of project outputs in real situations. Implications for ICT resourcing in the school, localization issues, technical support, integration with existing ICT technology and adaptability to school needs are examined.

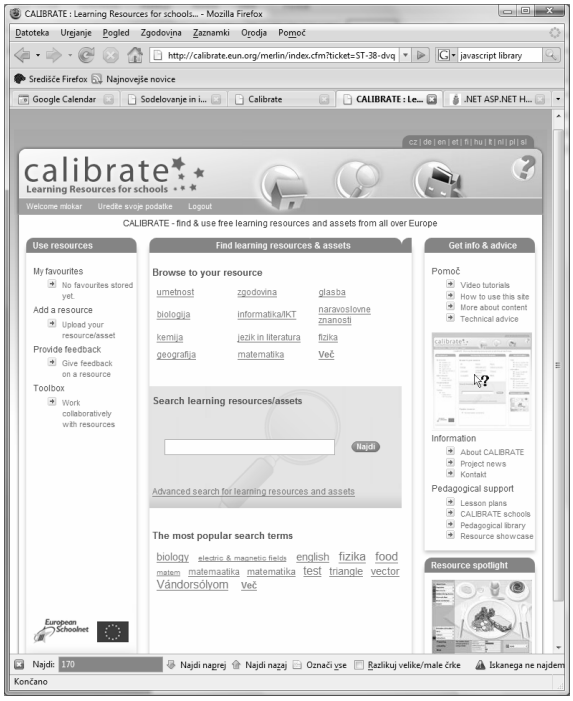
Economic dimension. This component brings together financial issues, e.g. purchase, set-up and usage costs, wider costs incurred and scalability.

Cultural dimension. This is an important but often neglected aspect. It covers issues related to different political and educational cultures across European countries and specific linguistic concerns. Schools will report on cultural aspects of localization, support for multiple languages, intercultural, trans-national collaboration.

8. Some practical examples

In this section we present some preliminary snapshots of Calibrate and LeMill portals, illustrating principles and features mentioned above.

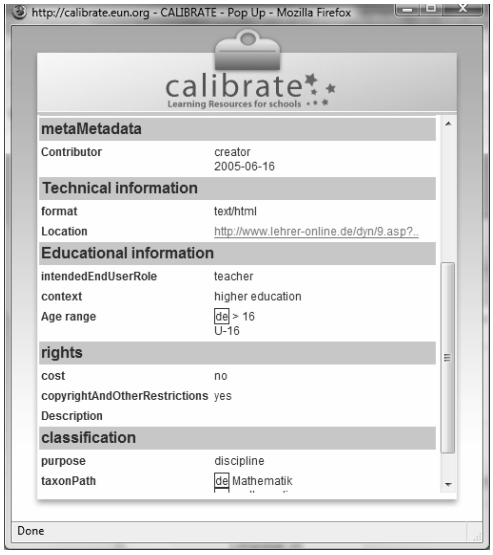
The main way of use of search and conducting Calibrate LRE will be through national portals. But as interfaces are still in the development and there has been a need to evaluate federated searches a language dependent entry point for searching the resources through all connected repositories has been made



Picture 1: CALIBRATE search entry point

When you try to search for a certain resource, a search has been performed through all interconnected resources. Results are joined and displayed regardless on the language in which the keyword, topics, age group, has been entered on particular repository. At the present moment search can be made on the basis of keywords, subject, age group and language of the resource, but there are no obstacles to develop much more elaborate search interfaces.

For each resource found one can display quite elaborate metadata as can be seen from the Picture 2.



Picture 2: CALIBRATE metadata

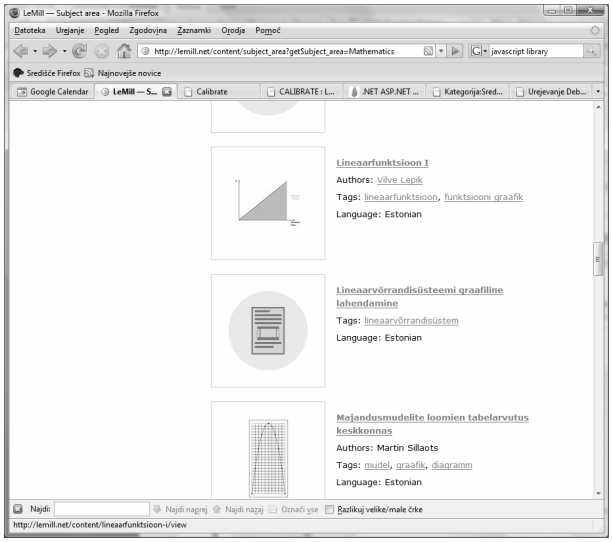
As mentioned before, an important part of the Calibrate project is learning Toolbox LeMill. LeMill is a web community for finding, authoring and sharing learning resources. First of all, you can find learning resources. You can use the resources you find in your own teaching or learning. You can also

add your own learning content to LeMill. You may edit your content and combine larger chunks of learning resources from individual media pieces. If you wish you may also join some of the groups producing or editing learning resources.

Picture 3: LeMill

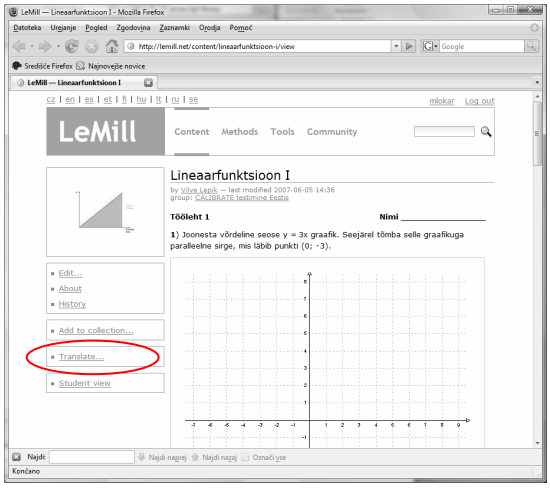
One of the most important LeMill's features is the idea of community performed translation of educational materials. Let's look at a simple scenario.

A teacher performs a search through Calibrate LRE and founds an interesting resource about linear function which has beena already uploaded to LeMill repository.



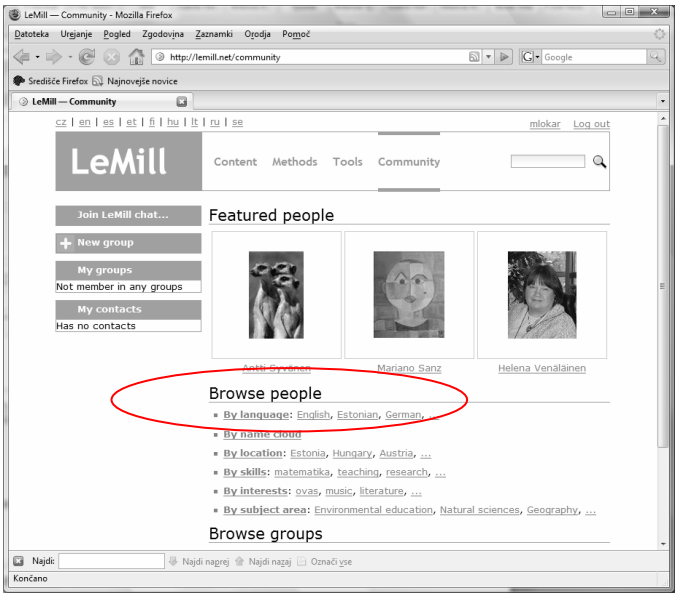
Picture 4: An interesting resource has been found

Unfortunately it is in an Estonian language which he is not familiar with.



Picture 5: Tool for translation

So he searches through LeMill community to find a member who speaks Estonian and is willing to translate the resource in a language they are both familiar with.



Picture 6: Searching for translators

Benefits of this approach are not only in the number of appropriate resources in native languages but also establishing community of EU teachers.

9. Conclusion

It is expected that outcomes of the CALIBRATE project could help EU teachers and pupils in their search for suitable electronic teaching resources as well as to make a solid foundation of open source tools for future repositories. But we should not forget the CALIBRATE and similar project just provide framework which each country, each partner involved should make the most of it through systematic work on production of electronic teaching resources and on encouraging the appropriate use of it, something we in Slovenia in the last few years seriously lack. If the repositories would not be

professionally maintained with sufficient support staff, if there is no systematic action on ensuring the quality … even the best tools and guidelines will not help.

10. Acknowledgment

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