EML IN THE SUPPORT OF MINORITY LANGUAGE LEARNING

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ABSTRACT

This paper outlines research being undertaken as part of a Teaching Company Scheme programme based on the Isle of Skye. It examines the rationale for using an Educational Modelling Language, such as the one defined by the Open University of the Netherlands (OUNL), and evaluates its potential role in delivering effective electronic learning environments for the teaching of minority languages. The uptake of EML as a practical solution to the needs of educational content developers is discussed, and some systems which offer different standards are summarised.

Keywords

EML, Gaelic, Educational Modelling, Reuse

1. INTRODUCTION

In the UK, the government has placed the assimilation of technology into a framework for *lifelong learning* and with the establishment of the National Grid for Learning. Tony Blair has noted that *'[w]e are all learners. …[there is]... a challenge to all of us as individuals to engage with new ways of learning and working*.' Implicit in this is the belief that these new ways of learning and working are *a good thing* – specifically, that e-learning offers new opportunities to those who teach and those who wish to learn sufficient, such that the UK should be '*a world leader in the development, deployment, use and export of digital learning services*'. The terms *e-learning* and, to an even greater extent, *digital learning services* are broad and vague. Some would argue that the 'e' in *e-learning* stands for 'experience' [2]. Others hold that e-learning is '*dynamic, happens in real time, is collaborative, individual, comprehensive, and* [that it] *enables the enterprise'*. At a simple level, perhaps, it can be described as '*a general term for education, training and information delivered by computers. It puts the emphasis on the gathering of skills and knowledge*' [21]. This definition incorporates the many different types of e-learning that exist, from CD-ROM based software packages to virtual online classroom environments, and it is, ideally, the '*power to learn anytime, anywhere'* [21].

Many have questioned the potential effectiveness and advantages of e-learning as opposed to traditional methods. Most agree that, if properly conceived and executed, e-learning provides a powerful tool for the communication and development of knowledge. It also offers unprecedented levels of accessibility and flexibility for the developer, teacher and learner.

Hamilton *et al* [8] show that e-learning can be more effective than traditional classroom-based, or person-to-person teaching. They conclude that the high degree of immediate contact available online between teacher and student can lead to higher success rates than from a traditional pupil-teacher relationship. This extends also to the degree of contact between students, as there is generally more peer-to-peer contact in an e-learning context, and this can be more enjoyable, if designed properly. Courses delivered electronically can also be customised to the particular needs of individual students, and it was found that this flexibility resulted in improved results, for both full- and part-time workers from a variety of backgrounds.

Many researchers agree that e-learning has many advantages [2], but these can be overstated. Netiva Caftori of Northeastern Illinois University conducted a study on the use of educational software in schools. She found that children often do not learn when using e-Learning. This was ascribed in part to a failure by teachers and software publishers, as they did not sufficiently evaluate the educational worth and curricular compatibility of computer-based learning activities. In general there was a lack of consideration for educational pedagogy in the development of the software. Caftori provides anecdotal evidence, for example, that a game designed to teach American history to children rapidly became an enthusiastic exercise in causing virtual bloodshed through which the true objective of the simulation was entirely lost:

> *'Children concentrate on reaching the end of the trail as fast as possible without regard for their companions or oxen. Children take no time to visit the landmarks and learn their history. Children shoot animals for the sake of shooting…[it] becomes an objective in itself; the type of the terrain and the animals associated with it are not noticed and/or learned by the student.'*

This exemplifies 'glitz and graphics' serving to obscure the learning objectives of an electronic course. It highlights a risk that, whilst knowledge can be effectively communicated by utilising the multimedia capabilities of modern computers, these

capabilities can also obscure and complicate the learning process. Caftori's findings were also highlighted by research into the support for different pedagogic systems present in several courseware packages that purported to provide complete solutions for the development, delivery and assessment of Web-based courses. It was concluded that none of the products had '*…been packaged in a pedagogically integrated fashion*' [7]. It is not surprising, then, that if such development systems fail to support and integrate traditional course structures and teaching methods, that the resulting products can be ineffective.

> *Learners get lost in many of the different types of information space we give them access to… The navigation support tools currently available make strong implicit assumptions that learners understand difficult [organisational] structures. Also they do not support some types of navigation that are vital for effective learning…A student can use a number of different interfaces in a semester. A student who is doing nearly all their work electronically may use more than a hundred* [15].

The design of user interfaces within e-learning resources is critically linked to success rates. Broadbent identifies the interface learning curve (Figure 1) - first having to navigate around an operating system and then to use the different, and often complicated structure of an e-learning application - as a major obstacle to the success of computer based training systems. This is compounded by the fact that a new interface must be learnt in order to take each course, although on occasion learning products from the same company can be similar. The diversity in interface design also imposes high demands on teachers and those who support e-learning, as they must become adept at handling a multitude of different navigation systems.

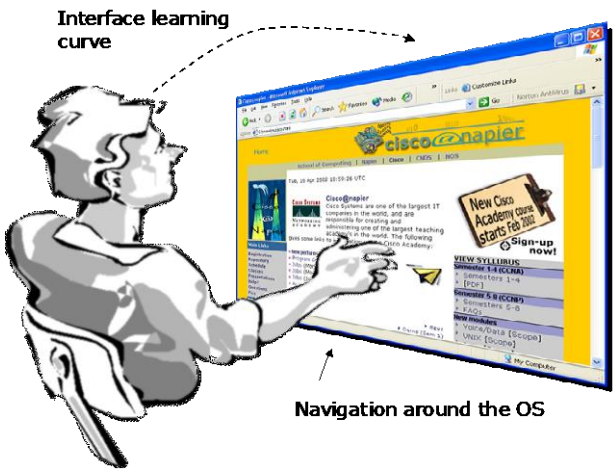

Figure 1: Interface learning curve

2. E-LEARNING THE LANGUAGE

In 1980, Solveig Olsen published an article in the *Modern Language Journal* which evaluated the impact of computer aided instruction for language teaching [3]. Of the 1,810 University language departments surveyed, the overwhelming majority stated that computers were not then being used to assist learning, and that they did not foresee a role for such technology in the future. In fact, the responses were overwhelmingly hostile with comments like *'[d]on't do it. It is a very stupid idea. Language is a living thing. You must really be desperate to think of anything so dumb*'. This situation has changed since then. For example, a recent survey of ICT use in modern foreign language teaching undertaken by the Fischer Family Trust found that, of 2,500 UK schools surveyed, 85% were using ICT to support classroom teaching that '*enabled them to work more efficiently and to save time*'. The survey also highlighted that WWW resources are used frequently, although it is interesting to note that the effectiveness rating allocated to them is often lower than those for traditional software packages.

At the same time, teachers found word processors and office suites amongst the most useful resources available to them, despite the fact that these programs are not language-specific or designed to teach language *per se*. Nevertheless, with modern foreign languages taught in almost every UK secondary school, there is a sizeable market for e-learning developers here. There is now a good deal of material, whether on-line, or content-based, but there has been much less development in the electronic resources for minority languages. A quote from a recent European Schoolnet article states:

> '*Availability of suitable (educational software) material in Kannada (Indian regional language) is next to nil,' complains engineer S. Jayaraman, a consultant to the Azim Premji Foundation (APF), a philanthropic network started by a prominent Bangalore technology house. The problem is not limited to Asian languages - European minority languages like Catalan and Gaelic are also rare.*'

This problem especially affects all the Celtic languages. For example the 2001 Fischer Trust study of ICT use in UK schools highlighted a concern amongst teachers in 39 Welsh language departments that the breadth of electronic materials available in Welsh was very limited.

Although the Internet provides an excellent platform for delivering courses that would otherwise be impractical, the relatively low *usefulness* ratings assigned to many such sites in the study suggest that they are badly tailored to the needs of schools. Entering *learn Gaelic* into an Internet search engine will typically produce a large number of results, but many of these will be personal homepages with sec-

tions on Gaelic vocabulary. Official sites of more structured courses are short in supply [6].

The objective here is certainly not to belittle the resources that *are* available but it is clear that, in comparison to more widely spoken languages, the Celtic tongues remain poorly supported. Of course, this is not just a numbers game, and it would be ridiculous to argue that the range of courses in Scots Gaelic should equal that for French. The central concern, however, is that e-learning is failing to deliver on its promise for these and other minority languages. This is due in large part to the particular unsuitability of traditional content development, publishing and distribution systems when applied to e-learning in these areas.

At this point, it is essential to understand that conditions for developing e-learning resources to cater for the teaching of minority languages are very different to those for mainstream foreign languages. The first consideration is that of market size. The 1991 United Kingdom Census recorded the following:

- **69,500** people in the UK aged three and over spoke Scottish Gaelic, with the greatest concentrations being in the Western Isles, Highland Region and Argyll. This is approximately 1.4% of the population of Scotland.
- **508,000** Welsh speakers, which is approximately 19% of the population of Wales.
- **142,000** Irish Gaelic speakers in Northern Ireland.
- The 1996 Irish Census showed that approximately **1 million** people in Eire have some level of Irish Gaelic, although this ranged from extremely basic to fluent. This is approximately 43.5% of the population of Eire.

It is clear, therefore, that educational developers for the Celtic languages are targeting a fairly small market, especially when compared to the potential sales generated through producing e-learning products for modern languages teaching in secondary schools. By comparison, there are **525** schools in Wales teaching Welsh to **82,000** children, and some **5,247** pupils studying or being taught Gaelic in Scotland. There is, of course, a heavily weighted comparison in that the reasons for studying Gaelic or Welsh in school are entirely different to those for taking, say, French. There are now no known monoglot Gaelic speakers in Scotland, just as there are none in Wales that speak only Welsh. In this sense, there is no practical reason for adults or children to learn these languages – one might holiday, for example, quite freely in Scotland speaking only English, but the same would not be true in Germany. The Welsh Language Act of 1967 made limited provision for Welsh to be used in the Courts and in public administration. Subject to any rules of Court, the language may be spoken by any person in legal proceedings. The Act also gives Ministers a discretionary power to prescribe Welsh versions of official forms, subject to the proviso that, in case of any discrepancy, the English text shall prevail. There is, on the other hand, currently no legal protection for Scottish Gaelic. It is fair to say, then, that students are most often motivated to study the Celtic languages for cultural and personal reasons, and many will come from families in which that language is already spoken. It is also to be expected that a certain proportion of parents will enroll their children in Gaelic and Welsh-medium education in order that they may benefit from smaller class sizes.

These studies show that the diversity and scope of e-learning products that can be seen appearing in other market sectors is unlikely to be replicated here for commercial reasons. Despite the fact that multimedia-based content can be cheaper to create than printed course books, there are still significant costs involved in production. The Internet can reduce costs further, of course, but it is understood that development of a high-quality, well supported language learning website for deployment amongst adult learners or in schools still requires significant ongoing investment to be successful.

The research introduced in this paper is primarily concerned with e-learning provision for Scots Gaelic. In Scotland, organisations like *Sabhal Mor Ostaig*, a Gaelic further and higher education college located on the Isle of Skye, are already producing courses for on-line Gaelic learners. This builds on the development of the University of the Highlands and Islands project, which links educational establishments in the North of Scotland with the aim of creating a University for the area. A major aim is to bring together content experts, technical and financial resources and students in a manner that would be eminently suitable for the production of high quality electronic learning resources in Gaelic.

Learning and Teaching Scotland was formed in July 2000 to develop the school curriculum between the ages of three and 18, to enhance teaching and learning and to promote the effective use of IT within schools. This organisation already produces much of the interactive learning material being used in Scottish schools, and it is to be hoped that the experience gained can be harnessed for Gaelic development. Finally, the Scottish University for Industry (SUFI) is intent upon leading '*a learning revolution which will offer both individuals and businesses the type of learning they need - delivered how and where it suits them best.'* To this end, a Learning Management System called Saba has been established, which is designed to deliver materials to the learner; provide tutorial support; track

student progress and record results from assessments [11].

These various initiatives demonstrate that the amount of interest in e-learning within Scotland is growing. The challenge is to ensure that provision for Gaelic, in common with other minority languages, keeps pace. The solution, it seems, will be to provide a foundation in creating electronic resources in the hands of those who can provide content. In order to be truly successful, such a system would have to generate material that could be easily customised, or localised, to a different language. In this way, courses produced, for instance, in Catalonia, where budgets and timescales might reflect the relatively large potential audience of Catalan speakers, would undergo a cheap and rapid customisation to result in a Welsh version of the same course (Figure 2). This would require a much more *teacher-centered* production system than is traditional – one that is more intuitive to a teacher than a programmer, and that can turn existing courses into e-learning products.

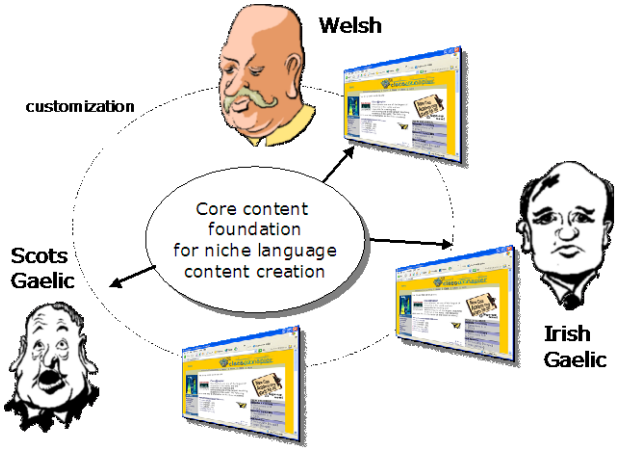

Figure 2: Niche customization

3. ENTER EML: A PLACE TO START?

In order to create an easily customizable system we need a proper educational modeling language. This language must encapsulate the educational processes in a generic way including content design, delivery, and creation. These can be described as an Educational Modelling Language (EML). An example of this type of language is one developed by the Open University of the Netherlands (OUNL) as a research project funded by the Dutch government. The system is based on XML (eXtensible Markup Language), and has now been released into the public domain where development proceeds on an open-source basis. Their project aimed to create a comprehensive notational system that would enable the codification of courses, course components and programmes of study. For this, EML describes:

- All the content and logic of a learning unit – from resources such as texts and assessments.
- The roles and interactions of teachers and students.
- And any environmental facilities that may be required (such as progress tracking functions).

It is essentially a method of specifying how different elements of an educational experience relate to one another, thus providing a complete source from which the course can be interpreted and presented on a computer. It is claimed that content creators have great flexibility when implementing a course in EML as it adopts a 'pedagogical meta-model' that provides a high-level abstraction of learning methods. Hence there is a basic system of interplay within EML-specified *units of study*, where actors (teachers and students) undertake roles within a learning environment. The objective here is to find '*a way to express any pedagogy at a sufficiently high level as to allow a diversity of approaches, while retaining usability*' [26]. In other words, EML has been designed to facilitate the creation of courses based on a wide range of educational philosophies (Figure 3).

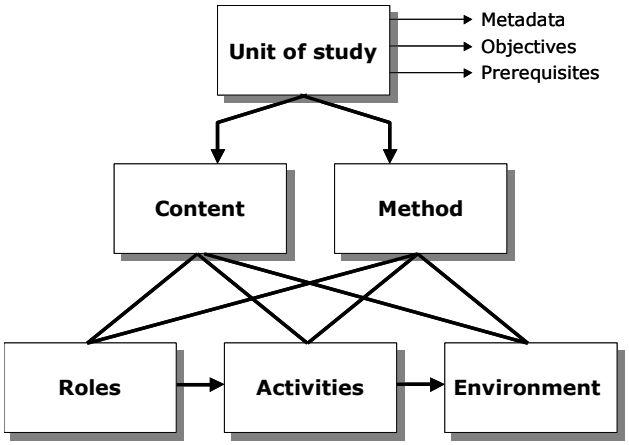

Figure 3: An illustration of the relationship between elements in EML

The fundamental container within an EML-defined course is the *unit of study*, which specifies all the elements of learning activities and learning resources. Units of study can in themselves contain additional, nested units, allowing for the replication of complex and detailed course structures. The first level contains:

- **Metadata**. These are associated with a unit of study gives information about the course, such as statements of copyright and authorship.

- **Objectives**. These may be set to specify what students should have achieved upon completion,
- **Prerequisites**. These define what qualifications or abilities are expected of those starting to study.

On the next level we have:

- **Content**. This describes all the sources of learning material and activities employed.
- **Method**. This refers to the structure, methodology and processes inherent in a course.

In turn, these containers encompass:

- **Roles**. Specify the type of people to be involved in a course – that is, teachers, students and moderators.
- **Activities**. Define the activities to be undertaken by those fulfilling the different roles.
- **Environment**. These are objects that provide the necessary functionality for studying, such as communication facilities.

Figure 3 provides an overview of the structure of a unit of study, and though the concepts involved appear complex, OUNL draws an effective analogy between the EML system and musical notation such as:

> *The key correspondences between the analogy of musical notation and an educational modelling language are that both representations are independent of medium, enable re-use, and are capable of representing an entire experience. Furthermore, the notations can be used for new work, new concepts, new media; the notations do not block creativity, they enable it.*

As EML can define and develop e-learning materials, there are distinct advantages from an educational perspective in adopting it. Netiva Caftori's concerns, discussed earlier, that much educational software displays an inadequate consideration of educational pedagogy may first be addressed. Although using EML does not guarantee that the resulting resources will be based on a sound philosophy, or at least one with which all teachers will agree, the system does allow for different methods of teaching to be replicated. Thanks to the systematic way in which a unit of study is defined – starting with general specifications, such as course titles, objectives and prerequisites and then focusing on development of the content and activities to fit this framework – it seems that an organised and uniform approach to course design is encouraged. In addition, OUNL supports the development of import and export filters to convert different data formats to and from EML. This raises the prospect of a Microsoft Word macro, for example, that could help to convert teachers' existing course plans and specification documents directly into an EML structure for implementation online (Figure 4). Furthermore, because modelling is text-based, it is possible for a number of people to work on different areas of a unit of study and for these elements, when complete, to be combined into a full course. Conversley, any element within the structure may be changed, removed, or replicated in another unit without difficulty. Indeed, **customisation** and **reuse** can be achieved simply by copying and pasting a block of notation between files. This must be contrasted with the complex operations of decompilation, collection and customisation required to reuse elements embedded in multimedia software or web pages.

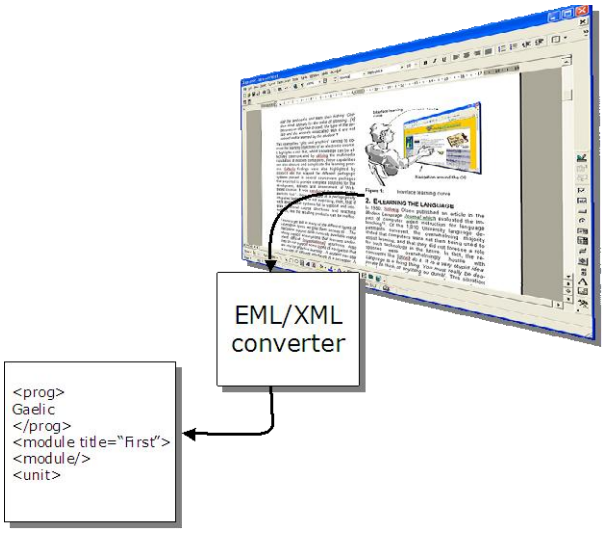

Figure 4: Word processor to EML/XML converter

Another feature of the EML scheme is that developers need not consider the method of final delivery when designing courses. Units of study are accessed through *player* programmes which interpret EML and display the results within their own user interface and control system. Divorcing learning content and technical delivery considerations in this way has a number of advantages:

- If students find a particular user interface too complex or otherwise unsatisfactory, they may, in theory, display the same course through a different player which is better suited to their needs.
- As long as the same EML player is used between courses, each may share the same basic operating characteristics of that program. OUNL

are developing an EML player called Edubox which is already being used in a number of different learning environments.

The player, itself, has not yet been made public, and development of initial prototypes continues with the assistance of Perot Systems, who intend to market a commercial version by the third quarter of 2002 [27]. It is hoped that as support for EML increases, a range of different players will become available.

Development will surely be driven by the fact that, just as EML allows for the design and delivery of courses to be separated, so the medium of delivery becomes irrelevant to designers. As long as a suitable EML player exists for a particular platform, any course developed in the language becomes portable. This is exactly because an EML file contains all the content required by a course and so any limitations, special features or characteristics of a particular delivery platform are dealt with exclusively by the player software. There is equally no need for developers to rely on vendor or platform specific technologies which may not be available within certain operating systems.

4. CHALLENGES FOR EML

For all the problems that EML would seem to answer or ameliorate, however, it is not yet a mature system. The fact that the modelling language is designed to be a complete format for encapsulating educational courses means that it must be broad in scope. The resultant range of functions and elements within the schema, however, suggests that it is too complex at present for those without programming experience. Eddy Forte of the Swiss Educational Institute of Technology recently highlighted this problem in asserting that *'[the] real practitioners [in this area] are teachers and they will only accept a simple basic model*'. He claims that teachers themselves are not sufficiently expert in pedagogy to use EML in its current form, a problem which stems from their largely empirical training - '*[t]hey need something simple, that they should be able to customise if they want.*' [30] Recognising these concerns, OUNL staged a three day conference in March 2002 [32] concerned with developing ideas for an EML authoring and content management environment. The objective here must be to provide a user-friendly development system which realises EMLs potential by maintaining the ability of developers to use different pedagogical systems when designing units of study. It is clear that the success or failure of EML as a medium which teachers will use, hinges on the availability of a user-friendly, yet versatile, development system. Indeed, when you consider the application of EML to minority languages teaching, its *potential* becomes irrelevant. In order to be utilised in this situation, there must be a front-end to the language which hides complexity whilst preserving the portability and flexibility that may make the system particularly valuable here.

At present, EML offers only another way to develop e-learning products, albeit with potential to become an innovative and useful system. There are, of course, existing standards and schemes that are designed to improve the quality and usability of interactive products, many of which are valid in an educational context, such as:

- **IMS Global Learning Consortium**. They continue to develop and promote open specifications for facilitating online distributed learning activities such as locating and using educational content, tracking learner progress, reporting learner performance, and exchanging student records between administrative systems.
- **Aviation Industry CBT Committee** (AICC) publishes guidelines for the aviation industry in the development, delivery, and evaluation of computer-based-training technologies.

It can be said, however, that EML differs from these other systems in one key respect. EML provides a complete standard for the production of educational courses, and in doing so, incorporates and builds upon the various development standards already available, whilst being specifically tailored to educational needs. Indeed, the IMS is currently considering EML as a basis for its future Learning Standards specification, and OUNL has received significant support from companies such as Cisco Systems and Macromedia, who are currently writing courses and software packages around EML [32].

OUNL's implementation of an educational modelling language is not alone. Systems such as PALO, TML/Netquest, CDF and LMML all purport to offer similar modelling systems to EML. CEN, the European Committee for Standardisation, are currently working to develop a Europe-wide standard system for modelling the learning process, based on combining elements of all the systems currently available. CEN have completed the first stages of standardisation, creating a framework for comparing different EMLs and undertaking a survey of existing EMLs. After the different languages have been compared, CEN intend to specify the scope of a *standard* educational modelling language [27]. It is submitted that widespread uptake of EML within education will not, and should not, occur before such standardisation is complete. If multiple, incompatible EML-based courses became available, the problems with current e-learning products which a standardised modelling language could solve would simply be made worse.

At this point it is worth mentioning the forthcoming MPEG-21 standard being produced by the Motion Pictures Experts Group and the International Organisation for Standardisation. MPEG-21 aims to provide an open standard for the delivery and consumption of multimedia. Essentially, it is an attempt to describe how the various elements within a multimedia experience relate to one another, and to create appropriate formats and specifications where gaps in the existing standards exist. As the initiative is described in the MPEG-21 overview document, '*[t]he vision…is to define a multimedia framework to enable transparent and augmented use of multimedia resources across a wide range of networks and devices used by different communities.'*

There are seven key elements to the MPEG-21 standard:

- A uniform digital item declaration schema.
- A digital item identification and description framework.
- A uniform content handling and usage standard;
- An intellectual property management and protection system.
- An interoperability standard for terminals and networks.
- A system for content representation.
- An event reporting and performance monitoring system.

Work on the MPEG-21 standard is ongoing and many of the elements described are still in their infancy. It is clear, however, that much of the functionality behind EML will be present in MPEG-21, despite the fact that this standard has a broader remit. It will be interesting to examine how EML and MPEG-21 develop, and whether the upcoming standard modelling language proposed by CEN will come to support MPEG-21 whilst maintaining the specific functionality required for educational development. It would seem, then, that the key to success for EML lies in standardisation. The establishment of multiple packaging and delivery protocols which serve many similar requirements would certainly result in fragmentation of the e-learning market and the ideal of software development for minority languages, where existing packages could be customised cheaply and easily, would be no closer. Certainly, the widespread acceptance of existing MPEG standards, which will be fundamental to the MPEG-21 packaging system, suggest that this system will be widely employed.

5. RESULTS

The EML language contains many structured, which can be used to define an education environment. An example of the EML code is:

```
<Unit-of-study>
<Metadata>
<Title>Speaking Our Language - Unit One</Title>
<Creator>Cànan Limited</Creator>
<Description>A course in Scottish Gaelic for beginners</Description>
<Keywords>gaelic beginner learn scotland scottish teach me</Keywords>
<Copyright>Cànan Limited 2002</Copyright>
<Study-load>
<Term>Self-paced distance learning</Term>
</Study-load>
</Metadata>
<Roles>
<Learner>
<Information-for-role>To complete learning activities as directed in conjunction with online tutor</Information-for-role>
Max
</Learner>
<Staff>
<Information-for-role>To support the learner's study online</Information-for-role>
</Staff>
...
<Content>
<Activity>
<Activity-description>There are many different ways of saying 'hello in Gaelic.  Practice saying 'ciamar a tha thu' and 'ciamar a tha sibh' in groups to learn the pronunciation</Activity-description>
</Activity>
...
<Multiple-choice-question>
<Question>How would you say 'how are you' to a policeman?</Question>
<Correct-answer>Ciamar a tha sibh</Correct-answer>
<Incorrect-answer>Ciamar a tha thu</Incorrect-answer>
</Multiple-choice-question>
...
</Content>
</Unit-of-study>
```

It can be seen that the EML tags relate to relevant educational terms, such as content, activities, staff, role, learners, and so on. This example demonstrates the functionality of the language, and shows that it may be intuitive to academics in the design and delivery of courses. In this case it has been applied to an existing Gaelic teaching scheme. The resulting EML should make this material more reusable, and portable.

6. CONCLUSION

OUNL's Educational Modelling Language provides the most complete system for describing the learning process currently available. EML encapsulates all the content and logic of a unit of study, allowing for unprecedented **reusability**, **portability** and **customisation** of electronic courses. These characteristics make it an excellent basis on which

to improve the breadth and quality of e-learning resources for minority languages, where considerations of scale, investment and economic return may prevent traditional educational publishers from providing products. There is still a large amount of work to be done, however, before teachers and language experts may feasibly use EML to develop courses, and to this end, efforts must be concentrated on providing a user-friendly yet flexible authoring environment. The establishment of a universally recognised, standards-compliant version of the currently available modelling languages is also essential. Once these conditions have been met, it seems that the incentives for producing courses and curricula based in EML will be overwhelming.

7. REFERENCES

[1] Bormans and Hill (eds.), *MPEG-21 Overview Document,* 12/01.

[2] Broadbent, B., *Championing E-Learning,* Pfeiffer Annual 2001, http://www.e-learninghub.com/championing.html

[3] Bush, M. and Terry, R., *Technology-Enhanced Language Learning,* 1996, American Council on the Teaching of Foreign Languages, http://moliere.byu.edu/volume/intro.htm

[4] Caftori, N. and Paprzycki, M., *The Design, Evaluation and Usage of Educational Software,* 1997, www.cssjournal.com/caftori.html

[5] Comunn Na Gàidhlig, *Gaelic Statistics,* 2000-2002, http://www.cnag.org.uk/beurla/gaelstat.htm

[6] European Schoolnet, *Education software needed in local languages,* http://www.eun.org/eun.org2/eun/en/About_eschoolnet/content.cfm?ov=7398&lang=en

[7] Firdyiwek, *Web-based courseware tools: Where is the pedagogy*?, Educational Technology, January-February 1999, pp. 29-34

[8] Hamilton and Richards and Sharpe, R. and C. and C., *An Examination of E-Learning and E-Books,* http://www.dcs.napier.ac.uk/~mm/socbytes/jun2001/Jun2001_9.htm

[9] Hodgins, W. and Conner, M., *Everything You Ever Wanted to Know about Learning Standards But Were Afraid to Ask,* Fall 2000, LineZine, http://www.linezine.com/2.1/features/wheyewtkls.htm

[10] *Irish Language Information*, http://www.eurolang.net/

[11] Kirkland, G. *On-line Learning In Scotland* in *ScreenSeen: The Magazine of the Society for Screen-Based Learning*, Summer 2001.

[12] Koper, R., *From change to renewal: Educational technology foundations of electronic environments*, 2000, Open University of the Netherlands, http://eml.ou.nl/

[13] Koper, R., *Modelling units of study from a pedagogical perspective*: *the pedagogical meta-model behind EML*, 6/01, Open University of the Netherlands, http://eml.ou.nl/

[14] Motion Pictures Experts Group and International Organisation for Standardisation, *MPEG-21 Overview,* http://mpeg.telecomitalialab.com/standards/mpeg-21/mpeg-21.htm

[15] O'Shea, T., *A Typology for Educational Interfaces*, 1997, http://www.acm.org/sigchi/chi97/proceedings/invited/to.htm

[16] Open University of the Netherlands, *Edubox Brochure*, http://eml.ou.nl/

[17] Open University of the Netherlands, *EML: An Explanation*, http://eml.ou.nl/introduction/explanation.htm

[18] Open University of the Netherlands, *Reference Manual for Edubox-EML/XML binding 1.0/1.0 (Beta version)*, 12/00, http://eml.ou.nl/

[19] Qualifications and Curriculum Authority and Department for Education, *Modern Foreign Languages*:

[20] *National Curriculum for England*, 1999, http://www.nc.uk.net/

[21] Sandtröm and Ax and Eriksson, E. and M. and J., *Computer Based E-learning: Distributed Multimedia*, 9/10/01, Luela University of Technology, http://www.cdt.luth.se/~peppar/kurs/smd074/seminars/1/2/5/elearning.doc

[22] Scottish Executive, *Revitalising Gaelic as a National Asset,* http://www.scotland.gov.uk/library3/heritage/gtfr-00.asp

[23] Scottish Office, *Implementing the National Grid for Learning in Scotland*, 1998, http://www.scotland.gov.uk/library/documents-w/ngfl-00.htm

[24] The Fischer Trust*, 2002 Report into Software Use in Secondary Schools*, http://www.fischertrust.org/

[25] The Western Isles Council, *European and Development Services - Gaelic Development*, http*://www.cne-siar.gov.uk/w-isles/develop/pilot/gaelic.htm*

[26] Wilson, S.,, *Macromedia releases eLearning Studio with support for LT standards*, 13/08/01, CETIS, http://www.cetis.ac.uk/

[27] Wilson, S., *CEN report progress towards a standardised Educational Modelling Language (EML),* 11/02/02, , CETIS, http://www.cetis.ac.uk/

[28] Wilson, S., *Cisco to work with OUNL on EML*, 06/11/01, CETIS, http://www.cetis.ac.uk/

[29] Wilson, S., *Education community advises European Commission on standards,* 10/10/01, http://www.cetis.ac.uk/

[30] Wilson, S., *Europe focuses on EML*, 15/10/01, CETIS, http://www.cetis.ac.uk/

[31] Wilson, S., *IMS takes EML as starting point for new specification*, 12/09/01, CETIS, http://www.cetis.ac.uk/

[32] Wilson, S., *OUNL conference on EML authoring and content management*, 20/03/02, CETIS, http://www.cetis.ac.uk/

[33] Wilson, S., *OUNL spins off EML player to Perot Systems*, 12/09/01, CETIS, http://www.cetis.ac.uk/

[34] Wilson, S., *Perot Systems to release EML Player in Q3*, 17/01/02, CETIS, http://www.cetis.ac.uk/